An Investigation into the Factors Influencing Infant Mortality in Cholsey Sub-District, Berkshire, 1892-1900

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An Investigation into the Factors Influencing Infant Mortality in Cholsey Sub District, Berkshire, 1892 – 1900

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An Investigation into the Factors Influencing Infant Mortality in Cholsey Sub-District, Berkshire, 1892-190

By Patricia Buckingham

Abstract

The recorded decline in Infant Mortality Rates from the mid nineteenth Century onwards has been attributed to factors such as improved environmental conditions, health education, and even improvements in climate. By undertaking a small area study of infant mortality rates of villages in the Sub-District of Cholsey in Berkshire for the period 1892-1900 these issues are examined in order to shed light on the factors influencing infant mortality in this particular area.

The basis of this study are Vaccination Birth Registers, little known primary sources containing standard information about all births registered in the area and deaths of infants who died before vaccination could take place. These registers, together with Parish Burial Registers, Medical Officer of Health reports, maps, a school log and other primary sources were used to construct a picture of conditions prevailing in this area for this period and they also provide a valuable insight into how vaccination was administered at a local level.

Cholsey Sub-District was chosen because Vaccination Birth registers were available and it was an area containing a diversity of environments and populations, ranging from very rural villages to rapidly expanding communities based round the industrial trades offered by a railway works. This diversity offered the opportunity to discover any significant differences in environment and to investigate whether these impacted on infant mortality

rates. The period was chosen because of the wide range of evidence available and by keeping the time span relatively short a more in-depth analysis of the sources could be made.

Aspects looked at include environmental conditions such as public water supplies and sanitation, seasonality, class and occupation, which have all been cited by researchers such as Szreter (1988,1991,1994), Williams (1992), Graham (1994), and Garrett and Reid (1995), as factors influencing infant mortality rates.

Contents **Page Number**

Acknowledgements

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List of Tables

List of Figures

Chapter 1: Introduction

The reasons for the decline in infant mortality from the middle of the 19th Century have been the subject of much debate. Theories concerning this decline have ranged from improvements in public health services, better sanitation and clean water supply, education in health care and feeding of infants, to economic factors such as higher wages and improved standards of living. However, all these theories are problematic in that the causes cited do not appear as factors in all examples and in all areas examined.

It is proposed that only by examining smaller areas in greater detail can a true picture of the factors governing infant mortality in those areas be discovered. It is postulated that not all factors will be influential or indeed present and that the causes of infant mortality will be peculiar to a specific area. It is therefore proposed that a small scale study of the villages of Cholsey Sub-District in the county of Berkshire for the years 1892 to 1900 will help to clarify and provide evidence to support some of the theories regarding the factors influencing infant mortality rates. In particular, it is hoped that evidence may be found that will show whether the hypothesis that environment was a major influencing factor on infant mortality is valid. The main sources for this study are Vaccination Birth Registers, which list all children born in the area, date of vaccination, and date of death if they were not vaccinated. The Registers also give details of the place of birth, father's occupation, child's sex and whether legitimate or not.

Cholsey Sub-District consists of a number of small, mainly rural villages located in the county of Berkshire at the time of the period under investigation 1892-1900 (Map 1).

A major reason for choosing this particular area was the fact that Vaccination Birth Registers were available for this area and period; these form the basis of this investigation. Cholsey is also interesting because it contains a mix of different types of centres of population. Most of these, as previously stated, are rural with their prime source of income coming from agricultural occupations. However, Cholsey also contains a larger and more densely populated area, centred round a railway works. Occupations here were mainly industrial and related to the railway. This area was rapidly expanding and it presents an interesting example of one of the contemporary phenomenona of the nineteenth Century: urbanisation. Through the reports of the Medical Officer of Health it was possible to see the very real problems caused by a rapidly increasing population, living in poorly built new housing without the benefit of a properly constructed infrastructure for public water supply or sewage disposal. A comparison could be made with the older, more established villages to discover what, if any, the differences were between the two types of environment and whether there were any corresponding differences in their respective infant mortality rates.

Cholsey Sub-District therefore presents a valuable example of contrasting environments from which a study of infant mortality may be able to confirm the findings of other researchers regarding the factors influencing infant mortality and possible reasons why there were differences in infant mortality rates between places. The fact that the period of this study is relatively short (1892-1900) means that it is not possible to identify any trend in infant mortality levels, however, it is felt that analysis of this time period will nonetheless be important in shedding light on the possible factors influencing infant mortality. Extending the period of this study was an option, but because of restricted research time it was felt that a more effective use of time would be to explore other sources, such as the parish burial registers, to make the existing data sample more reliable.

This introduction is followed by a chapter that examines hypotheses relating to the factors influencing infant mortality and the possible reasons for the differences in infant mortality rates between places. Following a description and an evaluation of the sources used in this study, which also includes a full discussion of vaccination practices in Cholsey Sub-District during the period of this study (1892-1900), a comparison is then made of the data from the Cholsey Sub-District Vaccination Birth Registers for 1892-1900 and the Registrar General's data for England and Wales and Cholsey Sub-District for the same period.

The following chapters look in more detail at environment and seasonality, class and occupation, factors which have been cited as major influences on infant mortality rates, to see what evidence there is of these in Cholsey Sub-District and what effect they had on infant mortality rates here. The thesis concludes by summarising the results and highlighting the importance of those findings which were only possible through the examination of these previously unresearched sources: the vaccination birth registers.

Chapter 2: Factors influencing Infant Mortality

As previously stated, it is not expected that all the factors that researchers have cited as impacting on infant mortality will be present, as such a small locale and a limited time period cannot reflect all the conditions occurring throughout the country. This chapter will review the evidence relating to environment, such as public sanitation and drinking water, Local Authority intervention, seasonality and female employment, this will enable us to put the experience of Cholsey that is examined in the rest of this thesis into context.

Geographical location is thought to be a crucial influence on infant mortality. This idea is expressed by Garrett and Reid, (1995, p.69) who state 'Where one lived was more important than who one was.' They note that this hypothesis was also reflected in the findings of Watterson, (1986, p.468), who pointed out that 'raising private incomes without environmental conditions would do little to improve infant mortality levels' (1995, p.74). This too, implies that environmental factors were more influential than one's immediate economic and social circumstances. Garrett and Reid (1995, p.79), also cite the fact that class and income, while significant, were not as significant as environmental factors, though increased income could create a better environment. 'Differences between places are much greater than differences within places; all classes within each environment tend to follow similar levels and trends.'

By looking at areas designated as agricultural, light industrial, or manufacturing they discerned differences in the rates of decline of infant mortality. Manufacturing areas showed later and steeper declines for all classes than did agricultural areas, demonstrating that the significant changes took place there much later and much faster. Woods, Watterson and Woodward (1988) make the important point that while there did seem to be a correlation between population density and infant mortality, infant mortality in some urban-industrial areas was excessive compared to the national pattern and it would 'be unwise, therefore, to ascribe all variations in infant mortality rates merely to differences in the extent of urbanization' (1988, p. 356).

They also noted that within urban areas there were variations in infant mortality rates. For instance they found that in London for the period 1880-1900, there were differences between east and west, inner and outer suburbs and that these variations 'were linked both to levels of poverty and to population density' (1988, p. 358).

As previously stated, the area covered in this study covers a mixture of different communities, some very rural and agricultural, others less so but rapidly expanding, and centred on a railway works. This diversity would appear to make this area a very good subject for a microstudy, as it is possible to establish whether these differences were reflected in the infant mortality rate reported for each community.

However, Garrett and Reid do not entirely dismiss the influence of individual behaviour as having a bearing on an infant's survival. They note that children born to Eastern European mothers had much lower death rates (1995, p.84), possibly indicating that health care practices were important. They also note that in places where the risk of death was particularly high, one's class, which could affect one's immediate environment, could provide some safeguard if one was wealthy, or if one's parents were unemployed one's chances of death were greater. It is proposed that an analysis of the occupations of the fathers of infants who died will shed light on this theory.

Williams and Mooney (1994, p.196-7), also stress the importance of environment as a significant influence on infant mortality. They maintain that the way in which each Local Authority interpreted various Acts of Parliament with regard to sewerage, drainage and water supply was an important factor in the differing infant mortality rates between towns. Indeed it is important to note that at a local level Acts of Parliament could be implemented and interpreted in very different ways and with varying degrees of time scale. Personalities and individuals could have a profound effect on whether and in what manner public health measures were undertaken, as will be shown from evidence contained in Medical Officer of Health reports to the Local Government Board (MH12/317).

Woods, Watterson and Woodward when referring to what they call the 'urban effect' – that is, higher infant mortality rates in areas of urbanisation - claim that it was most likely caused by climatic conditions interacting with 'poor urban sanitary environments which resulted in high levels of diarrhoea and dysentery among infants' (1988, p. 360). Although no data is available showing cause of death for the infants of Cholsey it is hoped that by looking at when these deaths occurred it can be seen whether they did mostly take place during the third quarter of the year, the time at which these diseases were most prevalent.

Williams and Mooney (1994) point out that an upturn in the infant mortality rate in the 1890's, when a succession of long, hot, dry summers contributed to the incidence of diarrhoea, exposed those towns which had failed to make adequate provision for public health. 'Towns reliant on conservancy methods of excrement removal, such as privies and ash closets, were picked out in this way, in contrast to those with the more hygienic water carriage systems.' (1994, p.207). This too, may be something that can be demonstrated in the study of the Cholsey area. The village of North Hagbourne was mentioned in the Medical Officer of Health's Report of 1893 (J/WB2/2), as being particularly unsatisfactory with regard to sewage disposal, and public water supply. It may be possible to see whether the infant death rate for this village differed greatly with others in the study that had better sanitary arrangements.

Another factor, which has been noted by researchers as having an impact on the infant mortality rate, is female employment. Graham (1994, p.339), states that while certain types of female employment had an undeniably detrimental effect 'it is clear ... that female employment - married or otherwise - was not the major cause of infant mortality.' Indeed, Garrett and Reid (1995, p.85), note that while there is a correlation between high levels of women's work and high levels of infant mortality, this is not observable in every place. Furthermore, they postulate that child death may have increased the chances of a mother returning to work, rather than the mother's work being the cause of infant death. This is certainly an area that would benefit from further investigation in order to clarify these issues. Unfortunately, it has not been possible to look at this issue in this study as very little evidence has come to light regarding female employment in general and there has been no evidence of married womens' employment.

Many researchers acknowledge the fact that the decline in the infant mortality rate differed from area to area. Lee (1991, p.55-65), states that the regional rates do not support the popular notion that trends in the IMR were consistent throughout the country, nor were they split tidily between North and South. He notes that different groups of regions had differing patterns of change, some peaking in 1861 or 1871 while others peaked in 1891 or 1901. However, he does state that after 1901 the downturn was 'universal and substantial,' (1991, p.59).

Lee also makes the point that information on cause of death for infants is very restricted, many being unclear or unclassified. Lewis (1980, p.465), too notes that the causes of death were not scrupulously investigated or clarified. A large number of deaths were due to developmental and wasting diseases but these were ignored by the authorities as it was believed that deaths occurring in the first month of life were mainly due to inherited weakness and were therefore a legitimate form of natural selection. Lewis goes on to claim that the success and importance of health clinics in the decline of infant mortality was greatly over emphasised by health officials because it tallied with their ideas of what was the main cause of infant death, namely incompetence and ignorance of the mother. Lewis asserts that because only a relatively small number of mothers attended these clinics and that in most towns where they existed there was only one health visitor per 500 hundred births, their influence must have been minimal.

Williams and Mooney (1994, p.199) also downgrade the importance of the effects of specific health care measures, such as the introduction of milk depots and the work of health visitors. They maintain that these measures had variable and limited impact.

Only a small number of towns ever established milk depots and the funds allocated for health visiting varied enormously, as did the expertise and qualifications of the visitors themselves. This point is valid particularly in this study as no evidence has been found of milk depots being established in the Cholsey area at the time of this study (1892-1900) and no information regarding health visitors has been located.

In 1903 the Medical Officer of Health for Croydon claimed 'dirty soil, dirty milk and dirty homes as the three main sources of infection' for diarrhoea (Lewis, 1980, p.465). In subsequent studies it was noted that towns with better sanitary and sewage arrangements generally had lower infant mortality rates, yet the focus for blame was still the mother. Lewis (1980) claims that mothers were held accountable for environmental conditions beyond their control. He notes that a Registrar General's report of 1911 showed that the infant mortality rate of the working class was much greater than that of the middle class, yet this was mainly attributed to the ignorance of the lower classes, not their poverty or poor living conditions. Lewis also states that a second investigation in 1913 by Newsholme, the Medical Officer of the Local Government Board, also showed the correlation between poverty and a high infant mortality rate, yet the emphasis was placed on a link between poverty and intemperance. The fact that not all poor mothers lost their children was attributed to differences in the quality of care.

However, Woods, Watterson, and Woodward (1989) point out that Newsholme did concede that poverty was an important factor, when he agreed that money earned by working mothers may have been a greater influence in reducing infant mortality than 'the same mother would be able to exercise under the circumstances of still deeper poverty which her stay at home would have meant' (1989, p. 115).

Lewis' study of early health care provision shows how narrowly focused they were. Even when there was good evidence to demonstrate that environment was a major factor in a child's survival it was ignored, preference being given to ideas regarding the intemperance and incompetence of working class parents. He makes the very strong point that 'because of the rigid insistence that the primary purpose of infant welfare services was educational and because of the medical profession's defence of its own interests, the great divide between preventive and curative medicine was nowhere better exhibited than in the maternal welfare services' (1980, p.486). This point underlines the problems confronting current researchers. Even with the evidence of previous reports and investigations it is necessary to bear in mind the prejudices and concerns of those authors in order to establish what were the real causes and influences on the infant mortality rate.

In conclusion, it has been shown that many researchers have linked high infant mortality rates to external factors such as sanitation and clean water supplies, and parental income where it could affect to a certain extent these environmental conditions. Local Authority attitudes on the implementation of public health measures and the speed at which these measures were enacted has also been cited as an influencing factor. Specific infant health care measures such as clinics and milk depots are on the whole dismissed as being ineffectual because they were not a major national feature and only employed by a relatively small number of local authorities.

Many early researchers laid the burden of blame for the high infant mortality rates on the poorer classes themselves, mainly because most deaths occurred within these classes. They ignored the fact that poverty itself may have had a part to play in influencing the environment in which these people lived. It is hoped that in this study of Cholsey, by looking at factors such as environment, seasonality, class and income it may be seen which of these most influenced the infant mortality rates.

It is only by undertaking small scale studies, such as the one proposed of Cholsey and district, and examining as many relevant factors as possible, that a better understanding will be reached regarding infant mortality. It is therefore proposed that analysis of data from the Vaccination Registers and parish Burial Registers together with evidence from maps showing house locations, wells and other sources of water, and Local Authority health reports, a clearer picture may emerge of the relevant factors affecting infant mortality. A questioning sources strategy was used because it was felt that there were a variety of sources which individually could be examined to illuminate different issues raised by previous researchers.

It is hoped that the following discussion of the sources that were available for this study will demonstrate their validity and value as evidence for the possible causes of the high infant mortality rates in Cholsey Sub District for the period 1892-1900.

Vaccination Birth Registers

Parishes became responsible for the provision of welfare services, including basic medical services, to those in receipt of poor relief in the sixteenth century with the introduction of the Poor Laws. Caring for people with smallpox became one of the most costly items of parishes' outgoings. Because of the fear of the spread of smallpox some parishes made it compulsory for their people to be inoculated, mainly because the cost of this form of preventative health care was cheaper than the costs involved in coping with outbreaks of the disease. In 1840 vaccination became the legal responsibility of the poor law unions, and was now to be provided free of charge to all, regardless of income. In 1853 vaccination was made compulsory and Boards of Guardians were required to appoint medically qualified public vaccinators. Information regarding the vaccinations was sent by the vaccinators to the registrars who compiled registers of successful vaccinations (Drake and Razzell, 1997).

However, it was not until 1871 that legislation was passed requiring poor law unions to appoint vaccination officers and to set up a comprehensive system of registration. Vaccination officers were notified of all births and the deaths to infants under one year of age in their area and were obliged to keep full records of all successful vaccinations, certificates of insusceptibility or exemption, deaths, or problem cases. This information was forwarded to them by the public vaccinators and private medical practitioners who were legally required to do so. Two types of register were compiled using this information: Vaccination Birth Registers and Vaccination Death Registers. Every child was required to be vaccinated before the age of three months, or at the next Public Vaccination held in the district after the child had attained that age. ('Notice of the Requirement of Vaccination' form).

The main primary sources for this research have been the Vaccination Birth Registers for the Cholsey Sub District, in the Wallingford Union, in Berkshire, (G/W 17/2, G/W 17/3, G/W 17/4). In total six Vaccination Birth Registers for this area survive, covering the period 1889 up to 1917. However, one register for the period 1901 to 1903 was unavailable for study due to its poor state of repair. As previously stated, the geographical area covered by these registers is mainly a rural one but does also include a rapidly expanding development of houses built to accommodate railway workers and their families, near to the main railway junction and works at Didcot, (Map 1). The remaining villages and hamlets covered by this study are more connected with agricultural occupations.

The registers were compiled by the vaccination officer and contain standard information on each individual child, (Appendix 1). Each entry is numbered consecutively 1 to 500 then returns to 1 again. Additional information is also sometimes included. For instance, if the family had moved away, details were shown that the case had been followed up until a certificate had been satisfactorily completed. In cases where the notice to vaccinate had not been given to a parent, details of the person to whom it was given are shown.

Because of the mixture of standard and non standard material contained in these documents, much useful information can be obtained regarding the backgrounds of the children who died before vaccination and a comparison can be made with those who survived in order to test various hypotheses. In particular the hypothesis that environment was an important factor in infant mortality can be studied by looking at the incidence of deaths that occurred in particular areas covered by the registers compared to other similar areas. Also, as parental income and occupation are believed to have an influence, this too can be examined by analysis of these registers.
For the purposes of this study three vaccination registers were studied in depth, (G/W 17/2, G/W 17/3, and G/W 17/4), which contain details of births from January 1892 to December 1900. It was felt that by keeping the period under examination relatively short, the data could be more intensively analysed. The major advantage that this data source has over many others is that it becomes possible to track a sample group from birth to death. It is important to note that whereas the Registrar General's figures for the

Infant Mortality Rate refer to the total number of deaths per year as a proportion of the total number of births in the same year, the analysis done on the samples from Cholsey is able to relate the number of deaths to a particular birth cohort: that is, all the births in a particular year can be traced to discover whether they died or survived to one year of age. A full discussion of the methods used to analyse this data and the reasons for employing them is given in a later chapter.

One serious problem with the data from these vaccination birth registers is that it does not include all the deaths of infants under one year of age. These registers only record those deaths that occurred prior to vaccination. This of course has implications for the Infant Mortality Rates that have been calculated using only this data and it can be seen by comparing these figures with the figures given in the Registrar General's Returns, (Tables 4, 5), where the number of deaths from the data obtained from the Vaccination Birth Registers differs to the numbers given by the Registrar General. It is possible that some of the 'lost' deaths may have occurred in a particular occupational or socio-economic group, a particular village, or at a certain time of the year, which would make any conclusions reached using only this data possibly unsound. To try and overcome this problem, all available parish burial registers have been examined so that, by using nominal record linkage, those individuals who were vaccinated but who subsequently died before the age of twelve months could be located. This information was then added to the data from the vaccination birth registers in order to give a truer picture of the Infant Mortality Rate.

However, a further unforeseen problem arose from this exercise: a small number of infant burials were recorded in parish registers that did not have any corresponding birth details noted in the vaccination registers. Although all births were required by law to be included in the vaccination registers this would appear to point to the fact that this was not always the case. Some of these cases can be accounted for by inward migration; births occurring outside Cholsey sub-district which were registered elsewhere. Other mistakes have been noted where the wrong date of death has been given in the vaccination register; and two separate entries made when possibly only one child was born. Again, this would appear to place a question mark over the total accuracy of these vaccination registers.

Another issue to bear in mind is that an element of bias could have been introduced by the fact that only burial records for Church of England and Nonconformist cemeteries have been examined. Although these account for the majority of deaths occurring within the period 1892-1900, it is possible that infant deaths that have not been accounted for may display features that could significantly alter any conclusions that are made on the basis of these findings. However, it is felt that because the number of 'missing' deaths appears to be small when the Registrar General's figures are taken as the accurate number of deaths, then this effect would be slight. It would appear that these missing deaths belong to one church cemetery as no municipal cemeteries had been established in this area at the time under investigation. The nearest municipal cemetery was located in Reading, which would seem to be an unlikely burial place for the children of families living in the small rural villages of this area.

A potentially significant weakness of the vaccination registers is that they do not give accurate information of the place of birth, in many instances the name of the village only is given. In cases where a child was born in a named house or inn it has been possible to trace them accurately from this source with the use of contemporary maps, although there were not many cases falling into this category. However, this problem, when relevant, can be somewhat circumvented. In many instances it was found that the villages themselves were so small, some only consisting of a cluster of houses, that the exact location of a particular cottage was not a major issue. Because these cottages were contained in a relatively small area and in most cases they shared a common water supply, the assumption has been made that environmental factors would generally be similar for all cottages in that particular village or hamlet. Similarly, in the case of the newer 'industrial' communities, it is also felt that conditions would be fairly uniform, as it would appear from the evidence of the Medical Officer of Health Reports that new homes were built without much regard to creating any sort of sanitary infrastructure beforehand.

Another point to note about the vaccination registers is that the entries were not always consistent. Handwriting was certainly an element that influenced the abstraction of information, as at least one vaccination officer had a written style that was at times quite difficult to decipher. Also, not every vaccination officer was particular or careful in his descriptions of the fathers' occupations. For example, some entries noted whether a man was classed as a 'master' or a 'journeyman' and gave very precise job descriptions, while others omitted this title altogether and gave only the vague classification of 'labourer' or 'railway worker'. These factors must be borne in mind when the question of differences between occupational groups is examined. It has therefore been decided to use two types of occupational/socio-economic classification when looking at this data, one based on Armstrong's system for York in 1851 (Drake and Finnegan, 1994, pp.48-9), and one based on type of occupation. It is felt that by doing this a clearer picture will be obtained of the different groupings and their different IMRs, and to discover if certain types of working community or particular occupations suffered higher IMRs, as well as being able to see whether higher incomes influenced survival rates.

It must also be borne in mind that sometimes mistakes were made when these entries were made in the register. As mentioned previously, discrepancies have been found when comparisons were made with parish burial registers. Instances have been found where the date of vaccination is given as the year previous to the child's birth, items have been transposed in the wrong column, or entries duplicated, in cases such as these a judgement has been made as to what the entry should read.

For example, in the vaccination register G/W 17/3 there are two entries with different registration numbers giving details of births occurring on consecutive days in October 1897. Both are unnamed females, they have the same surname and father's name and both were born in the same village. The father's occupation in both cases is stated to be a farm labourer. Both have the same date of death but are in consecutive years, one in 1897 the other in 1898. On checking the parish burial register an entry was found for an unnamed infant with the same details regarding father's name and place of birth who lived only for one hour. This burial took place in 1897 and would appear to correspond to one of the entries from the vaccination register. It is possible that twin girls were indeed born on consecutive days, one only surviving for a very short period, whilst her sister lived to the age of just over one year. It was only by examining the parish burial register in conjunction with the vaccination register that this item was discovered. There is still the problem however, that no burial appeared to be recorded for the older sister, but as she survived past the age of one year this does not affect the data in this study. Without the confirmation of the death of one of these infants from the parish burial register it would not have been known whether both of these entries were mistakes or one was a duplication.

As has been shown, vaccination registers contain much useful information but caution is necessary when assessing how reliable all the entries are. By using these registers in tandem with parish burial registers to confirm as many infant deaths as possible, it is felt that the resultant data is valid and worthy of further analysis. The following section therefore is a discussion regarding vaccination practices; the major proportion of information about this subject being derived directly from the vaccination registers.

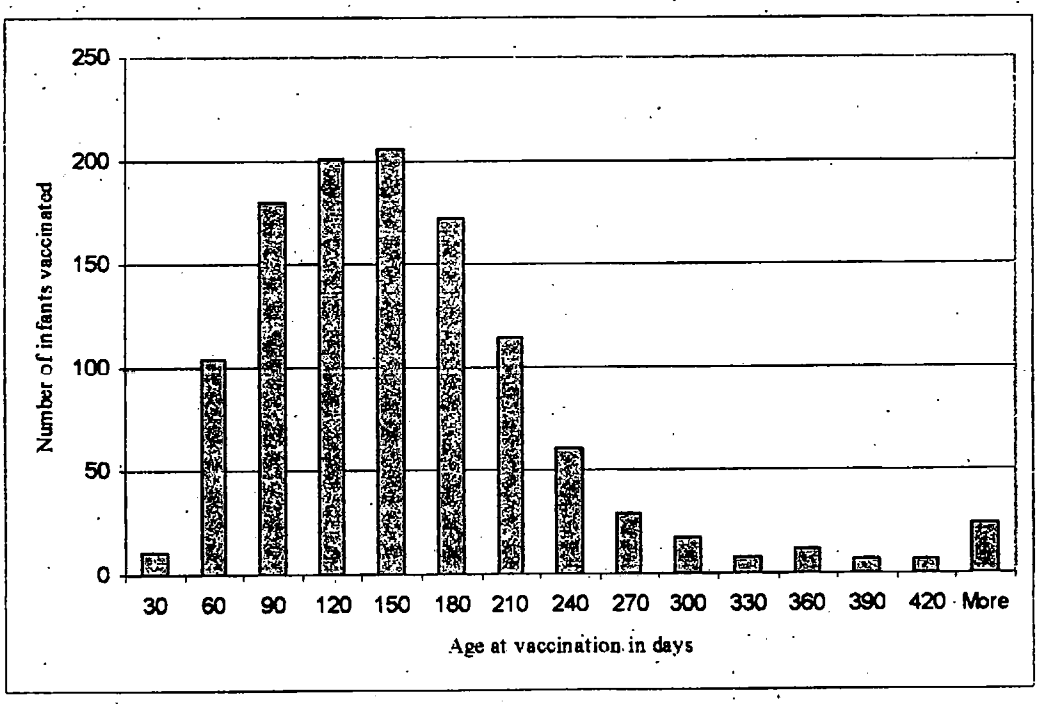
Vaccinators and Vaccination Practices

The fact that the registers show the date of vaccination and the name of the doctor issuing the vaccination certificate has also been useful in establishing how and when vaccinations were carried out. Because this information is unique it is felt that it would be useful to devote a section of this study in a discussion of these practices so that a better understanding can be achieved of the circumstances of the process of vaccination.

Firstly, it would appear that some doctors vaccinated only at certain times of the year and on certain days in the month whilst others vaccinated apparently when they felt it was appropriate. Confirmation of the fact that some of these doctors were public vaccinators who worked differently to private doctors was obtained from 'Notice of the Requirement of Vaccination' forms which were found inside one of the vaccination registers. These forms had been completed in respect of an infant, but for some reason they had remained with the register. They show that vaccination for a particular child had been postponed several times due to her weak state of health and that she was still unable to be vaccinated at the age of thirty months. More importantly, these forms give details of when and where vaccination took place and the names of the three public vaccinators who were responsible for administering them, Mr. Breach, Mr. Byass and Mr. Horne. Each vaccinator had his own surgery and in addition, it would appear that Mr. Breach and Mr. Byass also undertook vaccination sessions at several schools in the district in order to cover all the villages in the area. April and October were the designated months and Tuesday and Wednesday were the days these sessions were held. The fact that public vaccinators only undertook vaccinations in certain months of the year also meant that a child might have to wait until it was six months old before being vaccinated.

According to the Requirement forms, each session was for one hour, the exception to this was at Mr. Horne's surgery where he vaccinated on Fridays in April and October and the sessions lasted for two hours. This perhaps reflects the fact that he was responsible for the more compact area of Winterbrook, near Cholsey, (Map 1). Using these forms it has been possible to differentiate between the public vaccination officers who vaccinated without charge and those who apparently were private doctors who charged for their services. This information has been used to make comparisons between the different groups of patients to establish whether income was an influencing factor in the choice of a private doctor or a public one. Public vaccinators, it has been established, only vaccinated at set times in the year, which may have been an influencing factor on whether a child survived or not, as it would affect the length of time an infant was unprotected from smallpox.

Graph 1: Vaccination Register Data; Cholsey Sub-District 1892-1900 Distribution of Age at Vaccination in Days



As can be seen from the above graph, the majority of infants in the period under study were vaccinated between the ages of three to six months. This would appear to support the idea that the majority of parents were conscientious about getting their children vaccinated by the legally required limit and also that the vaccinators achieved their targets for this legal requirement in most cases.

Private/public vaccinators

Table 1: Analysis of the main public and private vaccinators, Cholsey Sub District 1892-1900, Vaccination Register Data

	Professionals Farmers, Masters & Shopkeepers	Other Categories	Total
Public			
Breach	23	293	316
Byass	2	101	103
Home	17	156	173
Total	42	550	592
Private			
Rice	22	63	85
Nelson	11	22	33
Freeborn	13	13	26
Total	46	98	144

The breakdown of who was vaccinated by whom is also very interesting (Table 1). Whilst this Table does not show the details for every medical practitioner who appears in these registers within the period 1892-1900, it includes the three from each category who appear most frequently. In this case, based on the evidence, Messrs Rice, Nelson, and Freeborn would appear to be private vaccinators. The figures would appear to indicate that there was a trend in the upper income groups to employ the services of a private doctor. Analysis of those patients vaccinated by private practitioners shows that a larger proportion of them, thirty-two per cent, came from the professional, 'master', shopkeeper, and farmer categories than those from the same groups who were vaccinated by the public vaccinators. Infants from these groups accounted for only seven per cent of the public vaccinators' patients. However, it is interesting to note that more than half (sixty-eight percent) of the private practitioners' patients were from the lower socio-economic categories. This may be the result of parents who, wanting to fulfil their legal and parental obligations, ensured that their children were vaccinated within the statutory time-limit, even if it meant paying for the services of a private doctor.

Table 2 : Cholsey Sub-District 1892-1900 Vacc. Reg. Data: Distribution of Patients by Class Vaccinated by Public/Private Vaccinators

Public	Class 1	Class 2	Class 3	Class 4	Class 5	Total
Breach	0	14	57	216	29	316
Byass	0	1	16	71	15	103
Home	0	8	39	100	26	173
%	0	4	19	65	12	100
Private						
Nelson	0	10	15	7	1	33
Rice	0	18	45	15	7	85
Freeborn	0	6	14	6	0	26
%	0	24	51	19	6	100
Total	0	57	186	415	78	736

The above table shows the distribution of patients by class vaccinated by these doctors. It shows clearly that the private practitioners' patients were drawn proportionally more from Class 2 and 3, who formed seventy-five percent of their patients, whereas the public vaccinators' patients were mainly from Class 4 and 5 at seventy-seven per cent. What is not shown on this table is that the nine individuals from Class 1 who are contained in the data from the vaccination registers were vaccinated or granted certificates privately, all by other doctors who do not figure largely in the vaccination registers as a whole. The one exception to this was an infant who died before vaccination.

A further study of the vaccination data shows that different doctors administered the vaccinations in different ways. One, Dr Rice, who appeared to have patients in East Hagbourne New Town and Didcot, vaccinated 85 infants over this nine-year period. (Appendix 2) There appears to be no pattern to the dates when this procedure took place, no specific day of the week was set aside for this purpose. His busiest year was 1895, with eighteen infants vaccinated, whose ages ranged from one month up to one year and eleven months. Another significant factor is that most of those whom Dr Rice vaccinated appear to belong to higher economic groups, drawn mainly from the professional and similar category, but only six came from the labourers' category and four were illegitimate births. The majority were drawn from the income groups such as artisans, skilled railway workers, farm workers and similar occupations, indicating that Dr Rice as a private practitioner, vaccinated either when he thought it was appropriate or when patients had the funds to pay him.

By contrast, another doctor, Dr Breach, known to be a public vaccinator, appeared to be responsible for a much larger and more widespread area, and tackled his workload much more systematically. Dr Breach was responsible for the villages of Aston Upthorpe, Aston Tirrold, North and South Moreton, Cholsey, East and West Hagbourne, Didcot and Moulsford. He vaccinated only in certain months, usually April and October and only on specific days in those months. All those vaccinated on a particular day came from the same village or area. The majority of Dr. Breach's patients were agricultural labourers, agricultural workers and railway workers. Very few vaccinations were given outside the designated months of April and October, where they do occur may indicate that there were specific reasons for doing so. For instance, it is interesting to note that a child vaccinated on 25 June 1892 was only three days old and lived in Cholsey. In the same month four infant deaths had occurred, a third of all the infant deaths recorded for that year. Two were in Cholsey, one in West Hagbourne and one in North Moreton . The Cholsey infants survived only one and two days respectively, one being born and dying on the 24 June 1892. This could account for the fact of the very early vaccination age of the child vaccinated on 25 June. Because no cause of death is given, it is not known whether there was an infection prevalent at the time or whether the two deaths in Cholsey were unconnected and due to genetic causes or causes specific to their own households. It may be possible, by examining local newspaper reports to ascertain whether there was an epidemic or outbreak of a particular infection in the area at the time, but lack of time has so far precluded this avenue of investigation. However, it does appear likely that these deaths motivated either the parents or the doctor to vaccinate earlier rather than later in this case.

Timing of vaccination therefore differed between public and private practitioners. This could have been an influence on whether an infant survived or not. Bearing in mind that private practitioners' patients were mainly drawn from the higher income groups, this could reinforce their enhanced chances of survival when compared to the disadvantages suffered by the lower income groups. The higher income infants had the benefit of better home environment, better nutrition, and as it would appear, they were vaccinated as soon as it was considered appropriate for each individual. By contrast, poorer income infants lived in less healthy homes, were probably not given the nutrition necessary for their healthy development and this was compounded by the fact that they had to wait until the designated time for their vaccination, so increasing their risk of unprotected exposure to smallpox infection. This evidence ties in with the findings of researchers such as Williams (1992) who concluded that 'socio-economic status and environmental conditions were important in influencing the pattern of infant mortality' and that 'both acted independently and the effects were cumulative' (1992, p.94). She found that there were clear differences in infant mortality rates between the different income groups even at times when both groups were suffering from high rates due to seasonal epidemics.

As has been shown, a great deal of valuable information has been obtained using these vaccination registers. Further information may be available in local directories regarding the doctors who administered the vaccinations. Knowing where they lived as well as where they worked would be an indicator of how accessible they were on a day to day basis to their patients, and may give some idea of whether medical advice, even on an informal basis, was on hand for the people of these villages. Also, it would be interesting to discover whether these medical practitioners were living in similar circumstances to their patients and if so, were aware of the health hazards faced by them day-to-day. However, though these issues are beyond the scope of this study, this could be a valuable future line of inquiry.

Other Primary Sources

In this section it is proposed to discuss the other sources consulted and the evidence they have provided to support and confirm the various hypotheses regarding the causes of infant mortality.

Parish Burial Registers

A major source that has greatly supplemented and brought in to focus the base data of the Vaccination registers has been Parish Burial registers. All the available Parish Burial Registers covering the area of Cholsey Sub-District were consulted for this study. These were mainly in transcript form or microfilm and microfiche. All parishes appear to be represented, although there do appear to be a number of individuals from some areas around Cholsey who could not be traced. No municipal cemetery was in existence at the time covered by this study and it has not been possible to establish where they could have been buried.

These records were useful in confirming the details of the vaccination registers. It was interesting to see the time interval between date of death and burial, usually about three days. Also it was interesting to note that, even in cases where a child had died at only a few hours of age, it was accorded a proper burial.

In nearly all cases the details of both the vaccination registers and the burial registers agreed. In some cases where there was ambiguity in the vaccination register entry this was clarified by the relevant burial register entry. For instance, in one entry in the vaccination register, the year of death was given incorrectly, showing that the infant had died prior to birth. This was clarified by finding the correct year of burial in the parish register.

The parish registers were also very useful in providing details of infants who died after vaccination but before reaching the age of twelve months. Twenty-eight individuals were found who came into this category and were added to the base data of this study. The majority of these individuals came from Class 4, with the largest number being agricultural labourers, followed by other railway workers. This may have introduced some bias into the data, but it is felt that, on the whole, these extra deaths reflect the true situation. Evidence from the other sources does seem to show that infants from the lower socio-economic groups were more at risk of death for various reasons than their wealthier counterparts.

Additional evidence was also found regarding the cause of death, information that was not available in the vaccination registers. In a couple of cases it was found that several members of the same family had died within a short space of time and this shed valuable light on the causes of death. In one instance whooping cough killed two young siblings, but this would not have been discovered from the information given in the vaccination register alone. In another example a young mother died shortly before her infant, presumably as a result of complications from the birth itself. This too is an instance of gaining additional useful information by combining two sources.

Census Enumerators' Books

Another source that was examined in order to supplement the evidence of the Vaccination registers was the Census Enumerators' Books. These were examined in an effort to identify individuals and their locations more accurately. However it was found that within the limited time-scale for this study this was not a practical solution. Whilst families who lived in named houses, such as those from the higher socio-economic groups and publicans who lived in named inns, could be identified, it was very difficult to positively identify anyone from the lower socio-economic groups. This was mainly due to the fact that there were many people in this area who had the same surnames. Also, because this was in the main a very rural area, roads did not have names and houses did not have numbers, so it was not clear which family group was being looked at in cases were there was more than one family with the same surname in the same village. It is possible that further study may enable some nominal record linkage to be undertaken, but the problems of duplication of surnames and inadequate identification of addresses would appear to be very difficult to overcome.

Medical Officer of Health Reports

In order to test the hypothesis that environmental conditions were a major influence on IMRs, sources such as Medical Officer of Health Reports were invaluable in providing evidence of general living conditions. Medical Officer of Health Reports for 1893

(J/WB2/2), 1883 (J/WB2/1), 1896, 1897, 1898, 1899 (MH12/317) were consulted in this case, these being the only ones available that cover Cholsey Sub-District for the period 1892-1900.

The Medical Officer of Health and the Inspector of Nuisances occupied an 'important place in local sanitary administration' (Local Government Report, 1909, p.20). They were required to be properly qualified medical practitioners, there were regulations governing their duties and the local authorities were able to claim back half their salary from grants paid to the County Councils. In small districts they were local practitioners, but some, acting for combined areas, gave all their time to this work. They were required to make an annual report on the health and social conditions in their own district to the local authority. The Local Government Board also examined these reports and drew attention to matters that needed remedying. The Local Government Board acted as an advisor on matters such as epidemics, they were also expected to keep a watching brief on the local authorities to make sure they provided 'such sanitary provision for their districts as necessary' (Local Government Board Report, 1909, p. 20).

These Medical Officer of Health Reports therefore contain valuable and accurate information regarding living conditions in the area. They cover matters such as housing, commenting on the number of inhabited dwellings, their condition, number of rooms per dwelling, and number of persons in each type of dwelling. In addition, they give details of the problems associated with areas that were expanding but did not have the infrastructure to support their increased population such as a reliable, clean water supply and efficient methods of disposing of sewage.

The strength of this evidence lies in the fact that they were official published documents, produced as reports to the Berkshire Combined Sanitary Districts, of which Wallingford Rural Sanitary District (Cholsey Sub- District was contained within this district), was a member. In addition to the information given on housing conditions, they also contain valuable details of the causes of death for under fives, which, while possibly not being very accurate and specific for today's standards, do provide some useful information on the types of illnesses that were prevalent.

Several of these reports were located together with letters and other documents sent to the Local Government Board in London (MH12/317). It was possible to see how the various problems and issues were tackled at a local level and how involved and laborious a task it was to implement civil works and to obtain funding for them. These documents were also illustrative of local feelings on these issues, particularly when they were going to be a financial burden on the ratepayers. Again, these sources illustrate the differences between areas that Williams and Mooney (1994) noted in the implementation of the various public health acts, which were very much dependent on the individuals who had a say on how, when and whether they were enacted.

The major value of these reports is contained in their, often graphic, descriptions of the appalling conditions of life for the people who lived in Cholsey Sub-District. Combined with the hard evidence of the data from the Vaccination Registers they provide a compelling picture of the poor environmental conditions that were prevalent here.

Maps

Maps of the area covered in this study were also very useful in showing why environmental conditions could be unhealthy (1st and 2nd Edition Berkshire, 15, Ordnance Survey). It was possible to locate all the specific villages and hamlets and some maps showed important details such as the number of pumps or wells available in a community, and the existence of streams and ditches for drainage. They also showed whether cottages were crowded together as in the newly built area of Hagbourne, or well spaced with large plots as in parts of Long Wittenham. These factors are useful indicators to living conditions. The original surveys for these maps were undertaken in 1876 and the 2nd Edition was produced in 1899, so it was felt that they did provide an accurate illustration of these communities at the period covered by this study. These maps showed how large physically these villages were and where they were situated in relation to topographical features such as the river and the railway line; features which could have a bearing on environmental conditions. For instance, part of Long Wittenham looks as if it may have been prone to flooding, this in turn could have contaminated the wells situated on that side of the village nearest to the river (Map 2) and could account for the higher IMR of this village when compared to its near neighbour Little Wittenham, which was not situated in such close proximity to the river.

School Log

Another important primary source which gave valuable supplementary information on environmental conditions was the Cholsey School Log (MF92471). It helped to build up a general picture of conditions during the period being studied. The Cholsey School Log for September 1893, (MF92471), stated that there was a typhoid epidemic in the area and that one schoolroom was converted into a temporary hospital. This highlights the fact that even in normal times medical services were generally inadequate and that domestic conditions in the area were considered unsuitable for nursing people back to health. It is also an indication that medical authorities were aware of the fact that cramped conditions could facilitate the spread of disease. This particular incident is also reported in one of the Medical Officer of Health Reports (J/WB2/2).

Another feature of the school log is that it notes the regular inspections of the Sanitary Inspector, who looked at the water closets and the urinals, and issued carbolic acid powder for their cleansing. In one instance in 1886 the school was fumigated after an outbreak of measles. Whilst this information might not seem directly relevant to this study because the children involved were over one year old, it does highlight the fact that public health, particularly with regard to children, was considered to be important and that at a local level these issues were treated seriously and rigorously by the local authorities and their agents. Also, it is felt that schoolchildren could have been agents of infection, bringing illnesses contracted at school back to the home environment, where there were infants.

The Minutes of Wallingford Borough

The Minutes of Wallingford Borough (AC2/2/2), for the years of 1889 to 1899 were also examined. While these did not particularly refer to the specific area being studied, they did contain useful information about health and sanitation problems that were prevalent in the general area at the time and could be taken as an indication of the likely environmental conditions existing in the Cholsey sub district. Many comments were about poor drainage, the unhealthy practice of keeping animals close to public water supplies and other public nuisances. Indeed the Medical Officer of Health is quoted as saying that the Wallingford by- laws were defective and that they should comply with the model code issued by the Local Government Board. This would appear to be a strong indicator that generally, local environmental standards were very poor, especially with regard to water supply, sewage disposal and drainage.

Pamphlets

Another illuminating source about local conditions was a bound edition of a collection of pamphlets (BRO.611092). A pamphlet entitled '*Life in our Villages*' contained a collection of letters and reports written to the '*Daily News*' newspaper in 1891. These reports aimed at highlighting the poor conditions that people in rural areas had to contend with. Although they were written in a very emotive and literary style they can still be used as evidence of the fact that rural conditions were considered to be very unhealthy, they illustrate the contemporary perceptions concerning the causes of death and infection. Their existence is also evidence that there was sufficient public concern about this issue for these letters to be published in the press and as pamphlets. However, it would be wrong to take these letters as evidence that conditions were the same in every rural village and hamlet.

Local Government Board Report

Valuable information was found concerning what contemporary officialdom considered the major causes of infant mortality in England to be. This was contained in a report entitled *Public Health and Social Conditions* prepared by the Local Government Board and published in 1909 (H.M.S.O., 1909). It has been a useful source of national data. It contains tables and graphs showing infant mortality rates for each year from 1850 to

1907 for England and Wales and also London. It also notes the annual mean temperature, as it was believed that climatic conditions affected death rates. Indeed it stated that there had been a material decline in infant mortality since 1899, which it attributed to more favourable climatic conditions and also the 'increased attention which has been given to the subject in recent years and to the administrative measures which have been taken with the object of saving the waste of infant life.' (p. 14). This report noted that the average annual rate of infant mortality for the period 1896 to 1905 for England and Wales was 147 per thousand live births. It also noted that the major immediate cause of death as shown on medical certificates was diarrhoeal diseases, (Table 21), which peaked in the months of August and September, and which it attributed to climatic conditions, (p.15). As this is an official report the data it provides can be taken as authoritative and a comparison can be made between these national figures and the local ones. It is also a useful indicator of official opinion on the causes of infant mortality. Infectious diseases were seen to be directly controlled by efficient sanitary administration. The Report noted that typhoid especially had declined 'under the influence of improved public water supplies, the substitution of water carriage for conservancy methods of sewage disposal, and the protection of milk and other foods against contamination by the specific infection of this disease' (p.16).

An interesting feature of this report is that it notes only that hospitals were for diseases, no mention is made of maternity provision. This report published in 1909 is evidence therefore that maternity provision even at this later date was still not considered as an influencing factor on the infant mortality rate. This is felt to be an important point, given that the majority of infant deaths occurred within the first few weeks of life. The possibility that some sort of medical intervention at this stage might influence survival rates had obviously not been considered, the prevailing idea being that any death at this early stage was probably congenital and therefore unavoidable. Indeed, it was not until the Notification of Births Act 1907 that all births were required to be notified to the local Medical Officer of Health within 48 hours, previously it could take up to six weeks.

Confirmation that medical intervention at such an early stage in an infant's life was rarely resorted to was established by examination of Patient Death Registers for Radcliffe Infirmary for the period 1892-1900. This hospital would have been the one to which anyone in need of hospital care would have been sent to from Cholsey Sub-District. No record of infant patients from this area were found, although this may mean that some were successfully treated. This however, would appear to be unlikely as most people were admitted to hospital only as a last resort and in the case of infants this rarely happened.

It is notable that this Report separates the issue of infant mortality from the question of public health measures such as sanitation, clean water supplies and the prevention of nuisances. Indeed, it emphasises that with regard to infant mortality the local health authorities should concentrate their efforts mainly towards 'the removal of ignorance as to the feeding and general hygiene of infants.'(p.23). To this end it claims that the Notification of Births Act, 1907, and the employment of health visitors to instruct mothers in 'the poorer districts' on the benefits of breast-feeding would make an impact on infant mortality rates. This would appear to be evidence in support of the claim made by Lewis (1980) whose study of early health care showed how narrowly focused the measures were, emphasising the incompetence of working class parents.

These sources were all useful in building up a picture of the specific environmental conditions in Cholsey Sub-District and of the contemporary perception of national environmental conditions. The Local Government Board Report is particularly useful in showing that while poor environmental conditions were acknowledged to be injurious to health, they were not specifically linked to infant mortality.

Friendly Society Records

Another avenue of research that proved unsuccessful and irrelevant in this case, was membership of Friendly Societies. It had been suggested by some contemporary authorities that the incentive of a cash sum or death benefit was an influencing factor on whether a child managed to survive or not. 'The most popular form of thrift among the working classes . . . is child insurance, and to this form of thrift child neglect and child murder have been almost wholly attributed by many persons' (Jones, 1894, p.3). In order to establish whether there was any evidence for this hypothesis the records of the Foresters' Heritage Trust (Ancient Order of Foresters Friendly Society) were consulted. (Source: Trust Co-ordinator, 1996) It was found that a group was started in 1886 that covered the areas of North and South Moreton. According to the 1899 Directory there were thirty- three members with an average age of twenty-seven and they were mostly young newly weds. Children from four to seventeen years could also be members. However, there was no evidence of benefit paid out for the funeral expenses of infants. It is possible that there were other friendly societies operating in the area at the time but no evidence of this has been found to date.

As can be seen, the evidence of these primary sources in the main confirms the existence of poor environmental conditions throughout the area of Cholsey Sub-District for the period 1892-1900. No sources were located that contained evidence of other possible factors influencing the high IMR. Of course, the absence of evidence does not mean that other factors were not at work, merely that it is not possible to gauge what effect, if any, that they had. However, it is felt that, within the tight time limits allowed for this investigation, all possible sources were examined. If more time had been available, it is felt that perhaps the CEBs may have added a little more depth to the picture of life during this period. But as explained earlier, this would only be true of those families who could be accurately identified.

In conclusion, it is hoped that the value of the evidence of the sources used here has been proven, and will provide some solid background for the following chapter which gives an overview of infant mortality in Cholsey Sub-District based on information from the Registrar General's data and data from the Vaccination Birth Registers.

In this section it is now proposed to examine in more detail the base data of this investigation derived from the Vaccination Birth Registers for Cholsey Sub-District, 1892-1900, and to compare this with both the data for the same area and period and national data from the Registrar General's returns. In this way it is hoped that it can be shown that, on the whole, the vaccination register data is reliable and can be used to come to some valid conclusions regarding infant mortality.

Comparisons between Vaccination Birth Register Data and Registrar General's Data

As previously stated, the raw data of this study has been the vaccination birth registers. (One infant born in 1897 was registered with no information regarding gender, also no date of death was recorded).

Table 3 - Cholsey Sub District Births & Deaths 1892-1900 Vaccination Register Data

	Males	Females	Total
Born	675	615	1291*
Died	77	51	128
Percentage	11	8	10
IMR	114	83	99

*** This includes the infant who was not assigned a gender.**

Table 4 - Cholsey Sub District Births & Deaths by Year 1892 – 1900 Vaccination Register Data

Year	Births		Deaths		Total Births	Total Deaths	IMR
	Male	Female	Male	Female			
1892	81	69	7	5	150	12	80
1893	87	81	12	8	168	20	119
1894	94	62	8	4	156	12	77
1895	60	77	11	4	137	15	109
1896	64	76	10	10	140	20	143
1897	100	67	6	4	168*	10	60
1898	56	66	12	7	122	19	156
1899	80	61	6	9	141	15	106
1900	53	56	5	0	109	5	46
Total	386	365	77	51	1291	128	99

- **This includes the infant who was not assigned a gender.**

Table 5 - Registrar General's Returns for Cholsey Sub District 1892 - 1900

Year	Total Births	Total Deaths	IMR
1892	150	24	160
1893	165	19	115
1894	156	12	77
1895	177	18	102
1896	145	24	166
1897	155	11	71
1898	132	24	182
1899	141	14	99
1900	113	7	62
Total	1334	153	115

Source: Registrar General's Returns 1892-1900 data supplied by Prof. M. Drake, The Open University

A transcript of entries in the vaccination registers for the years 1892 to 1900 was made and entered onto a computer database. All births occurring between these years were analysed and form the core of this study (Tables 3,4). Table 4 shows births and deaths per year as a comparison with the Registrar General's figures for the same period and location in Table 5. In addition, using nominal record linkage with data from parish burial registers, a further twenty-eight infant deaths that occurred after vaccination but before the age of one year were added to the database. It must be borne in mind that because different vaccination officers had different methods of recording data, some entries were very full and precise whilst others were more vague. Some individuals whom it is known were in a particular occupational category in one year are recorded differently in another year. In such cases it has been decided that the subsequent entry, even if it is less precise, must stand, because the measure of parental occupation must be made at the same point for all infants, that is; as it was recorded at the time of birth.

As can be seen from the above tables there are discrepancies between the Vaccination Register figures (Table 4), and the Registrar General's figures (Table 5). With regard to the Vaccination Register death figure for 1892, the 'missing' deaths could be due to the fact that some of these deaths would be of infants born in 1891, and therefore they would not be included in the data collected here, as only births from 1892 onwards have been recorded. (A discussion of the analytical methods used to compensate for this problem follows shortly). The 'missing' births are more problematic because the Vaccination Registers should contain all the births registered in the Cholsey Sub-District. A possible explanation is that births in the workhouse were perhaps noted separately and this may account for the differences in these figures. There was a workhouse in Cholsey, near Brightwell, yet none of the births noted in the Vaccination Registers would appear to have occurred there. One instance of an illegitimate infant born in Aston Tirrold and for whom there was a date of death, was subsequently found to have died in the workhouse. This was discovered by using nominal record linkage with the parish burial register.

Table 6 England - Annual Births & Deaths under Age 1 & IMR 1892 - 1900 (Registrar General's Returns)

Year	Births	Deaths	IMR
1892	897270	132603	148
1893	914182	145297	159
1894	889239	121918	137
1895	921860	148305	161
1896	917201	135487	148
1897	921104	143814	156
1898	922873	148249	161
1899	928640	151218	163
1900	926154	142943	154

Source: Registrar General's Returns 1892-1900 data supplied by Prof. M. Drake, The Open University

The Registrar General's figures for the years 1892 – 1900 for England (Table 6), show that for this period, apart from 1894, the IMR never dropped below 140 per thousand, and in 1899 it peaked at 163 per thousand. The largest proportion of deaths per year occurred in the third quarter except for 1892 and 1894, when the largest proportion of deaths occurred in the last quarter. By contrast, the Registrar General's figures for Cholsey Sub-District (Table 8) show that over the period 1892-1900 there was a more even distribution of deaths, with a slight excess in the first quarter. The data taken from the Vaccination Registers and the parish burial registers shows that the first quarter also had a greater proportion of deaths, closely followed by the third quarter.

Table 7: Comparison of Registrar General IMRs for England and Wales and Cholsey Sub-District and Vaccination register IMRs for Cholsey sub district 1892 - 1900

Year	IMR England	IMR Cholsey R.G.	IMR Cholsey Vacc. Reg.
1892	148	160	80
1893	159	115	119
1894	137	77	77
1895	161	102	109
1896	148	166	143
1897	156	71	60
1898	161	182	156
1899	163	99	106
1900	154	62	46

Source: Registrar General's Returns 1892-1900 data supplied by Prof. M. Drake, The Open University

Table 8: Distribution of Deaths by Quarter Cholsey Sub-District 1892-1900: Registrar General's Returns and Vaccination Registers/Parish Burial Registers Data

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Total
Vacc. Reg.	42	20	37	29	128
Reg. Gen.	43	37	39	34	153

Source: Registrar General's Returns 1892-1900 data supplied by Prof. M. Drake, The Open University

Table 7 shows the differences in IMRs for each year from 1892 to 1900 between the Registrar General's national figures and those for Cholsey Sub-District and the figures derived from the Vaccination Register data for the same years. From Table 8 it can be seen that the main shortfall between the Vaccination Register data and the Registrar General's appears to occur in the second quarters. It has not been possible to find any evidence of a reason to account for this.

There are problems when using conventional IMR calculations with the Vaccination Register data. For instance a child born in one year will be counted as a birth for that year, yet if he dies the following year this information will not be taken into account until the following year. In other words, the births are not matched with their corresponding deaths. In periods when birth rates are fairly constant this does not matter too much, but if for some reason the number of births in a particular year differs considerably from previous years the calculation would become biased.

With the data from the Vaccination Registers, births can be matched with deaths; that is, individuals can be tracked from birth for one year and if death occurs to an individual within that period of time it can be noted. Because of this possibility it has been decided to analyse the data using a cohort IMR estimator. This method takes into account the fact that the number of survivors at risk to die varies over the first year. An important point to remember is that a sizeable number of individuals are lost to observation once they have been vaccinated as the period of observation moves on, therefore the number known to be at risk of death changes also. The age at which most infants were vaccinated also affects any findings.

An aggregate estimate assumes that in a year, the number at risk of death is the number of births minus the cumulated deaths, whereas cohort estimates take into account the fact that the number of individuals at risk varies according to factors such as migration, age at vaccination, and so on. Therefore the age at which most individuals were vaccinated can have important implications for the findings. The fact that most of the individuals in this study who survived long enough to be vaccinated within the first year of life were indeed vaccinated, means that by the end of each year in the study the number of individuals taken as being at risk of death was very much reduced.

Cohort calculations relate to one age group and one birth-cohort.[1] Deaths are matched to their corresponding births, particularly in situations where there is no migration. This cohort IMR estimator is therefore appropriate in this case as it is more accurate than the aggregate method and where net migration is thought to be low enough to be ignored. Cohort estimates assume that the number of births minus the number of deaths to the cohort equals the number who survive to their first birthday. In cohort estimates any individuals who were vaccinated before the age of one year are assumed to have left the cohort as no further observation of them is made. In order to deal with this situation

[1] Cohort analysis method devised by Jim Oeppen and Eilidh Garrett, History of Population and Social Structure, Cambridge.

whereby the number at risk of death varies over the first year of life, an analysis method has been devised using a spreadsheet where the first year is divided into a number of age groups (in this case days). The number of deaths is then related to the number of survivors at risk in each age group to estimate the mortality level of each age group and then combined to arrive at an overall measure of IMR. (Appendix 3 shows this calculation in respect of births for 1894). This would appear to be a more accurate method of calculating what an infant's chances were of surviving to its first birthday using the data available here. This is the main reason why it has been decided to look at birth cohorts, that is, tracking all those individuals born in a particular year to see if they survived to age one year. It is hoped that by using these methods to analyse the data the problems inherent in this type of evidence may at least be highlighted, if not overcome.

The national figures for the period 1892 to 1900 show that the number of infant deaths per thousand live births only once fell below 140 (Graph 3). For Cholsey the aggregate figures for the same period vary from 164 per thousand to around 37 per thousand (Table 9), but using a five year moving average these figures are shown to be more consistently above 100 per thousand live births (Graph 2).

Table 9: Vaccination Register Data, Cholsey Sub-District 1892-1900: Births and Deaths by cohort

Year	Births	Deaths (cohort)	Aggregate IMR	Cohort IMR
1892	150	15	100	260
1893	168	20	119	304
1894	156	16	103	175
1895	137	12	88	222
1896	140	19	136	192
1897	168	12	71	207
1898	122	20	164	425
1899	141	11	78	243
1900	109	4	37	92
Total	1291	129*	100	256

***This includes an infant born in 1900 who died in 1901.**

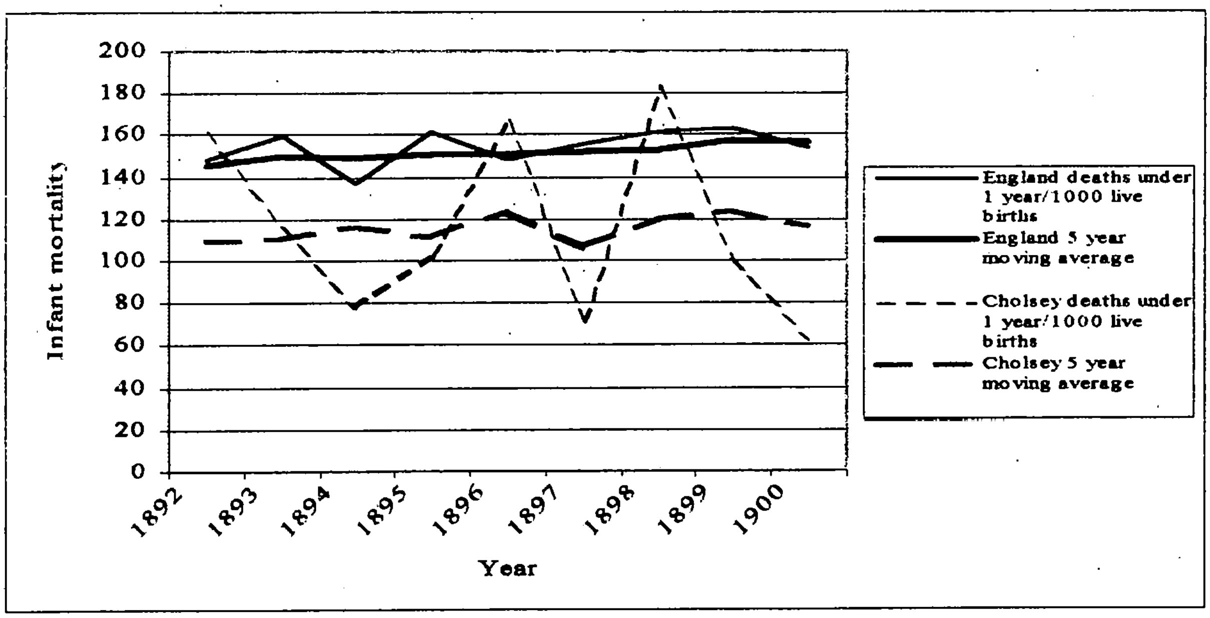
Using the method of analysis which shows the individual rates of infant mortality for each birth cohort, it can be seen that the proportion of infants who died is much higher than would be supposed from looking at the Registrar General's figures (Table 10).

Table 10: England & Cholsey Registrar General's IMRs and Cholsey Vac. Reg. IMRs (Aggregate and Cohort for 1892-1900)

Year	England	Cholsey R.G.	Cholsey Vac. Reg. Ag. IMR	Cholsey Vac. Reg. Cohort IMR
1892	148	160	100	260
1893	159	115	119	304
1894	137	77	103	175
1895	161	102	88	222
1896	148	166	136	192
1897	156	71	71	207
1898	161	182	164	425
1899	163	99	78	243
1900	154	62	37	92

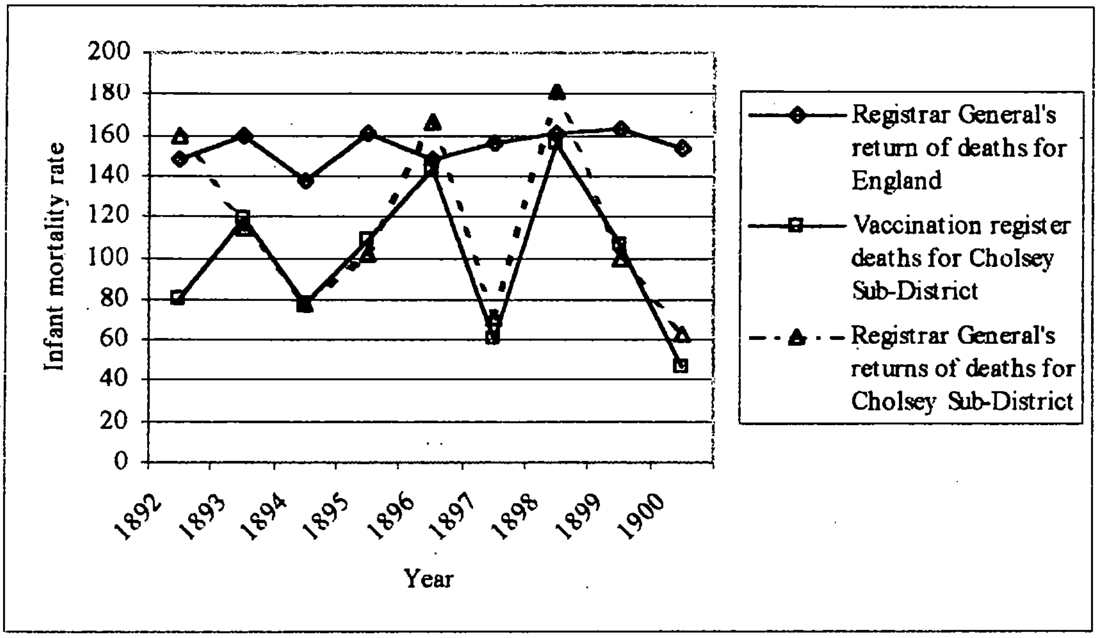
Source: Registrar General's Returns 1892-1900 data supplied by Prof. M. Drake, The Open University

Graph 2: England & Cholsey Deaths Under 1 Year per 1000 Live Births and 5 year Moving Averages 1892-1900, Registrar General's Returns



Source: Registrar General's Returns 1892-1900 data supplied by Prof. M. Drake, The Open University

Graph 3: IMRs from Registrar General's Returns for England and Cholsey compared to IMRs from Cholsey Vaccination Register data 1892 - 1900



Source: Registrar General's Returns 1892-1900 data supplied by Prof. M. Drake, The Open University

The cohort rates for Cholsey, although much higher than the national figures, do mirror their peaks and troughs with the exception of 1898, when the Cholsey rates reach an all time peak of 425 per thousand (Table 10).

As previously stated, the most important immediate cause of infant death in England, as noted on medical certificates, was diarrhoea, followed by atrophy and debility (Local Government Board Report, 1909, p.15). Climate was held to be an influencing factor on this phenomenon as mortality from diarrhoea was found to be highest in the third quarter of the year. Also, it was noted that urban infant mortality was about one third heavier than rural infant mortality. It is hoped that by comparing those areas in Cholsey Sub-District that were more urban and industrial with the rural villages it can be seen whether this was true here. Also, by comparing other possible influences such as socio-economic status and class, the hypothesis that environment is the major influence on infant mortality rates can be tested.

Table 11: Average Age at Vaccination, Cholsey 1892-1900 Vacc. Reg. Data

Occupation	No. in category	Age in Days	Aggregate IMR	Cohort IMR
Artisans	72	168	83	204
Agricultural Labourers	249	134	72	274
Farmers	24	178	0	0
General Labourers	65	125	92	425
Illegitimates	52	185	231	416
Journeymen	63	153	79	306
Masters, Shopkeepers	89	143	146	327
Others	50	182	40	102
Other Agricultural Workers	226	148	106	176
Other Railway Workers	283	145	117	300
Professionals	31	204	161	289
Railway Labourers	36	144	83	N/A
Servants	50	119	40	347

Table 12: Average Interval between Birth and last date observed Cholsey 1892-1900 Vacc. Reg. Data

Class	No. in category	Days	IMR
Class 1	9	126	110
Class 2	85	179	129
Class 3	346	150	101
Class 4	726	145	100
Class 5	124	136	81

Analysis of the vaccination register data for Cholsey shows that there were notable differences in the ages at vaccination of the different occupational groups (Table 11). As previously stated, this has implications for the reliability of the data because when looking at the differences in aggregate IMR between the different occupational/class groups (Tables 11, 12), like is not being compared with like. A group that has a longer birth to vaccination interval will be more likely to contain more deaths and hence have a higher IMR, than a group that has a shorter birth to vaccination interval. Again, this is the reason for analysing the data using the cohort based infant mortality rates. This takes account of the fact that for each cohort, individuals leaving the cohort, due to vaccination, migration etc, are removed from the calculations and the resulting infant mortality rate is a figure based on those known to be still at risk of death at the end of the period under study. In this way it is hoped that the difference in the period of observation for the different groups will not affect the results.

As can be seen from Table 11, a cohort IMR could not be calculated for the railway labourers because all the infants in this cohort had either died or been vaccinated and hence removed from observation before the twelve month period had been reached. The average age at vaccination for agricultural workers excluding labourers was 148 days whilst for artisans it was 168 days. Their aggregate IMRs would lead one to believe that artisans had a much better chance of survival. However, by also looking at their cohort IMRs it can clearly be seen that this apparently was not the case, with the artisan cohort having an IMR of 204. By looking at the different areas where these two occupational groups lived it is hoped it will be possible to establish whether there was a link between poor environmental conditions and the higher death rate of the artisans.

When two groups who have similar average vaccination age are compared, the general labourers and agricultural labourers, the difference between their cohort IMRs is striking, that of the general labourers being the highest of all the different groups. This could be due to the fact that although both occupations were poorly paid, agricultural labouring was a more regular source of income, whereas general labouring was more casual. The fact that general labourers would need to live in more urban areas in order to obtain work might also have a bearing on their mortality rate as these areas were also known to have poorer environmental conditions. Agricultural labourers themselves had a much greater cohort IMR than skilled agricultural workers, which might be attributable to the difference in income between the two. This could have resulted in poorer living conditions and a less nutritious diet, both of which have been cited as having an influence on IMRs.

Another important point to note is that the infants from professional families had an average age at vaccination of 204 days, the longest interval of any other occupational group. This of course means that they were under observation for a longer period than most other groups. However, it must be borne in mind that these averages have been pushed up by just a few individuals who were unable to be vaccinated until they were quite a lot older than most infants at vaccination. Most of these infants were vaccinated at six months or less whilst all but three were vaccinated at the age of one year. Again, the fact that a cohort IMR has been calculated means that hopefully any bias created by the differences in ages at vaccination has been greatly reduced.

The group of illegitimate infants also has a long average interval between birth and vaccination. However, again, the majority of illegitimate infants were vaccinated by the age of six months and all but three were vaccinated at the age of one year. This would seem to imply that other factors were influencing their high IMR rate. Is it reasonable to assume that because they were illegitimate they were living in poor environmental conditions due to the low wages of the mother? If so, this could have been a significant influence on their chance of survival. Certainly in one case the parish burial register notes that an illegitimate child was resident in the workhouse at the time of death, possibly due to the fact that her mother was deceased, which is also mentioned in the vaccination register. By looking at other factors such as place of birth and the mother's occupation it may be possible to find evidence to show whether any other factors were influencing this group's IMR.

The occupational group 'farmers' is notable in that there are no deaths recorded for them. Although they are the smallest group in number it is felt that, whilst this may be a contributory factor in there being no deaths recorded for them, the fact that they would probably be living on the outskirts rather than in the centre of communities, may have contributed to their better survival.

As has been shown, the data from the vaccination registers agrees in the main with the Registrar General's Returns for Cholsey, although there are some discrepancies in the numbers of births and deaths given for each year. However, it is felt that in spite of this, because the trends shown in the data from the vaccination registers appear to agree with those of the official figures (Graph 3), this data can still be used to try to come to some firm conclusions regarding the causes of infant mortality. The following sections will look in more detail at the available evidence in order to try and understand the factors involved in influencing infant mortality in Cholsey Sub-District from 1892-1900.

Chapter 5: Environment and Seasonality

One of the major factors influencing the infant mortality rate is environment. Garrett and Reid (1995), Williams and Mooney (1994), Watterson (1986), and Woods, Watterson and Woodward (1988, 1989) all agree that where one lived and the sanitary conditions prevailing in that area were the most significant factors in an infant's survival. It is therefore proposed to examine in more detail the prevailing environmental conditions existing in Cholsey Sub-District for the period 1892-1900. To do this, Cholsey will be divided into two distinct environments: rural and industrial. The rural villages are those whose main sources of income are derived from agricultural occupations, whilst the industrial villages are those centred near the railway works or where a large proportion of the inhabitants earn their income from the railway or its associated industries. The evidence from MOH reports regarding drinking water supplies and sewage disposal could help to explain the differences between the IMRs for the different villages.

Analysis of the vaccination registers show that in some villages and hamlets infant mortality rates varied significantly (Table 13). In particular, the rural villages of Aston Upthorpe, Brightwell and South Moreton would appear to be very unhealthy, judging by their individual based IMRs, although if aggregate IMRs are used the industrial village of Hagbourne also stands out.

In this case the term 'industrial' is being used to indicate communities that were mainly dependent for income on non-agricultural forms of occupation, such as the railway works and its associated industries. These centres of population also tended to be fast-growing and overcrowded and subsequently had poor environmental conditions, particularly with regard to sewage disposal and public water supplies. Didcot is also an industrial village in that its main source of income derived from the railway, but unlike Hagbourne, which mainly consisted of new, low-grade housing, it remained a more compact community that did not expand to anything like the same extent. Their respective populations in 1871 were: Didcot; 369, Hagbourne; 941. By 1911 Hagbourne had a population of 1,430 whilst Didcot's was only 707. (Registrar General's Returns). The fact that Didcot's infrastructure to cope with the problems of drinking water supplies and sewage disposal for a growing population was already in place, may account for its lower IMR.

Table 13 Total Births and Deaths by Village 1892 - 1900, Cholsey Sub- District Vaccination Register Data

	Births	Deaths	Aggregate IMR	Cohort IMR
Aston Tirrold	55	6	109	182
Aston Upthorpe	23	4	174	544
Brightwell	155	13	84	319
Cholsey	304	23	76	271
Didcot	99	9	91	270
Hagbourne	344	46	134	266
Little Wittenham	32	2	63	91
Long Wittenham	118	12	102	116
Moulsford	23	0	0	0
North Moreton	27	3	111	190
South Moreton	89	9	101	315
Sotwell	22	2	91	91
Total	1291	129*	100	256

***Includes an infant born in 1900 who died in 1901**

If the 'industrial' villages of Hagbourne and Didcot are directly compared with the 'agricultural' villages it can be seen that the both the aggregate and cohort rates are noticeably higher for these newer, faster growing centres of population. However, it is also noticeable that the cohort method reduces the difference observed with the aggregate method between the two types of village. This could be due to the fact that the cohort method of analysis more accurately reflects the true situation of an infant's chances of death before the age of one year. The aggregate method is only an estimate of IMR, as deaths are not matched to a set of births, whereas the cohort method does match each death to each birth. The aggregate IMRs of both the agricultural and industrial villages is less than the average IMR for England and Wales for 1892-1900, which is 154.

Table 14 : Comparison of Vaccination Register Data for Industrial and Agricultural Villages 1892-1900

Villages	Births	Deaths	Aggregate IMR	Cohort IMR
Hagbourne & Didcot	443	55*	124	269
Agricultural Villages	848	74	87	248
Total	1291	129	100	256

*Includes an infant born in 1900 who died in 1901

Evidence for the hypothesis that poor environmental conditions can adversely affect infant survival rates has been found in the descriptions of local conditions given in the Medical Officer of Health Reports to the Local Government Board. In a report from 1885, reference is made to the 'North Hagbourne drainage question'. It was proposed that the earth closet system should be adopted and provision made for drains to carry surface water and slop drainage away, to be dealt with by filtration through land or by irrigation passed into ditches. The MOH report of 1893 also notes that North Hagbourne was mostly tenanted by railwaymen and their families and many new, mostly 'low class' and cramped cottages were being built with insufficient gardens. It was noted that there was a problem of disposing of sewage satisfactorily.

These factors could influence infant mortality rates particularly in the hot summer months by being favourable to diseases that were reliant on warm weather for bacterial multiplication. Contamination could occur through the increased number of flies which would be attracted by any sewage which was inadequately dealt with. In turn, these flies might carry bacteria which contaminated artificial infant feeds during preparation.

By 1896 matters appeared to be deteriorating (MH12/317). A request for a loan of £6,700 was made to the Local Government Board to fund a sewage scheme for East

Hagbourne but no final decision to grant it was made. The MOH reported that inspections of the area did show some improvement but did not satisfy the need for an efficient sewerage system and a reliable water supply. Most of the nuisances he reported relate to foul closets of the cesspit variety, bad drains, and of five samples of well water inspected, only one was passably good. Again, a lack of pure drinking water would be a significant influence on infant mortality rates, because many gastro-enteric infections are caused by bacteria in water supplies, and whilst these infections are not always fatal in adults they can be lethal to infants, who succumb much more quickly to the effects of dehydration.

Letters and reports to the Local Government Board in 1897 show that a loan of £1,921 was approved for the drainage project in East Hagbourne. However, there did appear to be local opposition to the scheme. A letter was sent to the Local Government Board by some owners and occupiers stating that they did not want a water supply to flush the sewers. They maintained that the sewers could be flushed using pumps and an artesian or common well. It would appear that they were more concerned about a possible increase in their rates rather than the health aspect.

In the MOH Report of 1897 (MH12/317), it was noted that the most important event had been the commencement of work on the new sewerage system for North Hagbourne and the adjoining part of Didcot. The MOH commented that it would 'effect greatly needed improvements and the equally necessary levelling up of the general sanitary condition of not a few cottages of which the village so largely consists.'

However, from letters and reports written in 1898 (MH12/317) it is apparent that the sewage scheme was not yet completed. Only a few houses had been connected to the system and a request for a further loan in order to accomplish this was made. Interestingly, a letter from some inhabitants of Hagbourne to the Local Government Board complained about the state of the roads, which were said to be impassable in winter, and commented on the fact that the recent work done on the sewage system had exacerbated the problem. The managers of North Hagbourne Church of England school also wrote to the Board querying the need to have a water supply to the school to flush the sewers. They stated that the closets had been satisfactorily emptied by cart, and saw no need for the expense of putting in a special water supply. They also stated, rather disingenuously, that they were concerned about possible contamination of the river if this system was implemented. It is noted that even by this time Didcot still required 30 premises to be connected to the system and East Hagbourne had 50 connections outstanding. It would appear that sanitary conditions took a long time to improve.

Table 15 Condition of Wells in Hagbourne & Didcot 1899 (MOH Report 1899)

Water Supply	Didcot	Hagbourne
Good	14	41
Scanty	10	13
Dry	10	21
Total	34	75

The MOH Report of 1899 (MH12/317) stated that the sewage works were now completed and that house connections were 'well advanced'. There does appear to be some indication of the efficacy of this measure in the fact that both the Registrar General's figures and the Vaccination Register figures show a decrease in the IMR for 1899.

The wells in North Hagbourne had been inspected in March and because they were mostly shallow or surface water wells, they were stated to be of unreliable character. However, it is felt that this unreliability referred to the amount of water available, not its quality, as there appears to have been concern regarding a shortage of water at this time due to the very dry conditions. Any water shortage however, must have had an impact on public health and hygiene. An idea can be gained of the prevailing conditions from the report, which stated that just over half of the 75 wells serving 155 houses had sufficient supplies, supply was scanty in 13 cases and had failed entirely in 21 cases (Table 15). On a positive note it was reported that the opportunity was taken to clean and deepen those wells that had dried.

The border between Didcot and the adjoining village of Hagbourne became less distinct over time with the expansion of the 'new town' area of East Hagbourne. Didcot had 34 wells; these serviced 71 houses, including the railway station and 6 hotels and inns. Less than half the wells in Didcot had a good supply, and this was an area that was obviously more commercial with its relatively large number of hotels. Only 14 had a good supply, 10 were scanty, and 10 were dry. Again, the consequences of a limited or non-existent water supply could be severe, particularly in an area that was already noted for its poor housing, cramped conditions and generally unhealthy environment.

Another health hazard mentioned is the slop sewage, which was entering the village drain at East Hagbourne and some was also getting into the watercourse. This report (MH12/317) stated that the percentage of infantile deaths to births was very high at 17.9 per cent and that three infant deaths were caused by diarrhoea. In view of the prevailing conditions it is surprising that matters were not worse.

A further report of the same year (MH12/317) states that the watercourse at Hagbourne was fouled by a drain from the scullery of one of the cottages, which passed directly into the road drain. In addition, foul smells were entering the said premises making them insanitary, and it was felt that the pump needed to be relocated, as well as alterations made to the cesspit.

The Boot Inn at East Hagbourne was also singled out as being particularly unhealthy. The drain from the urinal and the sink went straight into the road drain and the double vault closet was situated within thirty feet of the indoor well. The MOH declared that the water was therefore unusable and that the second pump well, which was close to the stables where soakage was likely, was also suspect and required analysis. The cottages connected to this inn were described as decayed, the well needed cleaning and the midden hole needed to be abolished. He stated that two foul vault closets should be converted to pail closets.

The area immediately adjacent to the Boot Inn was in no better state. Cottages opposite were described as having their slops entering the road gully. Indeed, most of the houses from that part of the road, up to the head of the watercourse, appeared to be directly or indirectly connected to the road drain. Sediment, which gathered in these gullies, was collected and on examination was found to contain black sewage deposit. Matters were so bad that the MOH thought that a thorough, house to house inspection of the village was required to identify and put a stop to all drains conveying slop or sewage into the road drains.

It would appear, on the basis of the available official evidence that this particular village was in a very poor and unhygienic condition. The fact that it was also rapidly expanding to accommodate the increasing numbers of railway workers would only have served to exacerbate matters. It is therefore, not surprising that for the period 1892 to 1900 it had one of the highest aggregate IMRs of all the villages examined (Table 13), taking into account its larger population.

Table 16: Distribution of Deaths by Occupation: Hagbourne 1892-1900: Vaccination Reg. Data

Occupation	Deaths
Agricultural Labourers	3
General Labourers	2
Illegitimates	4
Masters, Shopkeepers	8
Other Agricultural Workers	7
Other Railway Workers	20
Professionals	1
Railway Labourers	1
Total	46

Table 17: Distribution of Deaths by Class: Hagbourne 1892-1900: Vaccination Reg. Data

Class	Deaths
1	0
2	5
3	17
4	20
5	4
Total	46

There were 46 infant deaths in Hagbourne within this period. Of these, the fathers' occupations were mainly shown to be from the middle income groups, such as the skilled railway workers and even the masters and shopkeepers category. Even though deaths not rates are being discussed in this case, this would still appear to strongly support the hypothesis that environmental conditions were a major influence on the IMR and that while income and occupation did have an influence they were not as significant as environmental conditions. (The issue of income/class as a factor influencing infant mortality will be discussed more specifically in a following chapter.)

Looking at the three agricultural villages with very high cohort IMRs it can be seen that again, it is the middle and lower income/class groups who contributed most to these figures.

Table 18: Distribution of Deaths by Class 1892-1900: Vacc. Reg. Data

Village	Class 1	Class 2	Class 3	Class 4	Class 5	Total
Brightwell	0	1	4	7	1	13
Aston Upthorpe	0	0	1	3	0	4
South Moreton	0	0	2	7	0	9

Although it is acknowledged that only small numbers are being dealt with here and only deaths not IMRs, it is felt that it is significant that the occupational distribution of these deaths appears to be fairly widespread. Not all the deaths occur in Class 5 or only in the General Labourer or Illegitimate categories. Two of the deaths in Brightwell occurred in the Master category and five of the South Moreton deaths were to skilled railway workers. Again, this would seem to support the argument that environment was a major influence on infant mortality. These three villages are not closer to each other geographically than they are to the other villages in the study. Brightwell is north of the railway line whilst South Moreton and Aston Upthorpe are to the south of it. Indeed, Aston Upthorpe is almost adjacent to Aston Tirrold, yet that village's aggregate and individual IMRs are much lower. This would appear to indicate that the conditions prevailing in these three villages were peculiar to them; possibly a contaminated water supply or other unhealthy environmental phenomena were important. Williams (1992) found in her study of infant mortality in nineteenth century Sheffield that 'the pattern of infant mortality closely matched environmental conditions and the topography of the town' (1992, p.80). If a particular area was badly drained or otherwise adversely affected by its location this could impact on the health of its inhabitants. Another important feature that can be seen from the maps of these villages is that not all the cottages appeared to have wells. This may have been an influencing factor on the standard of hygiene in some cottages, for instance, if they were some distance from the nearest source of clean water. This could also possibly account for the high IMRs of these villages.

Another important factor in the differences in infant mortality rates between villages and areas is the rate at which public health measures were enacted, as noted by Williams and Mooney (1994). Often there were great delays between a problem being identified and then being resolved. This was demonstrated in the evidence of the reports to the Local Government Board (MH12/317), where it took several years to extract funds for the construction and completion of a more efficient sewage system. Opposition and obstruction to this scheme came not only from the Local Government Board itself, which had to safeguard public funds from being wasted on ineffective health measures, but also from local groups, such as the managers of North Hagbourne school, who saw the improvements as being financial liabilities to themselves as ratepayers.

Szreter (1988) showed that issues such as these were important factors in the differences between locales. He noted that improvements in environmental conditions were often only achieved as the result of ' innumerable unsung local skirmishes between frequently underpaid health officials.... against the parsimonious representatives of the majority of ratepayers' (1988, p.25). This certainly would appear to have been a factor in the case of Hagbourne, where poor environmental conditions resulted in one of the highest infant mortality figures in the area under investigation. The other villages in this study, whilst they are occasionally mentioned in the correspondence between the Medical Officer of Health and the Local Government

Board do not seem to have been suffering the same environmental conditions that affected Hagbourne. It could therefore be reasonable to assume that their better sanitary arrangements contributed to their lower infant mortality rates, although other factors may well be involved, such as greater concentration of upper income groups making a more robust population, due to better nutrition.

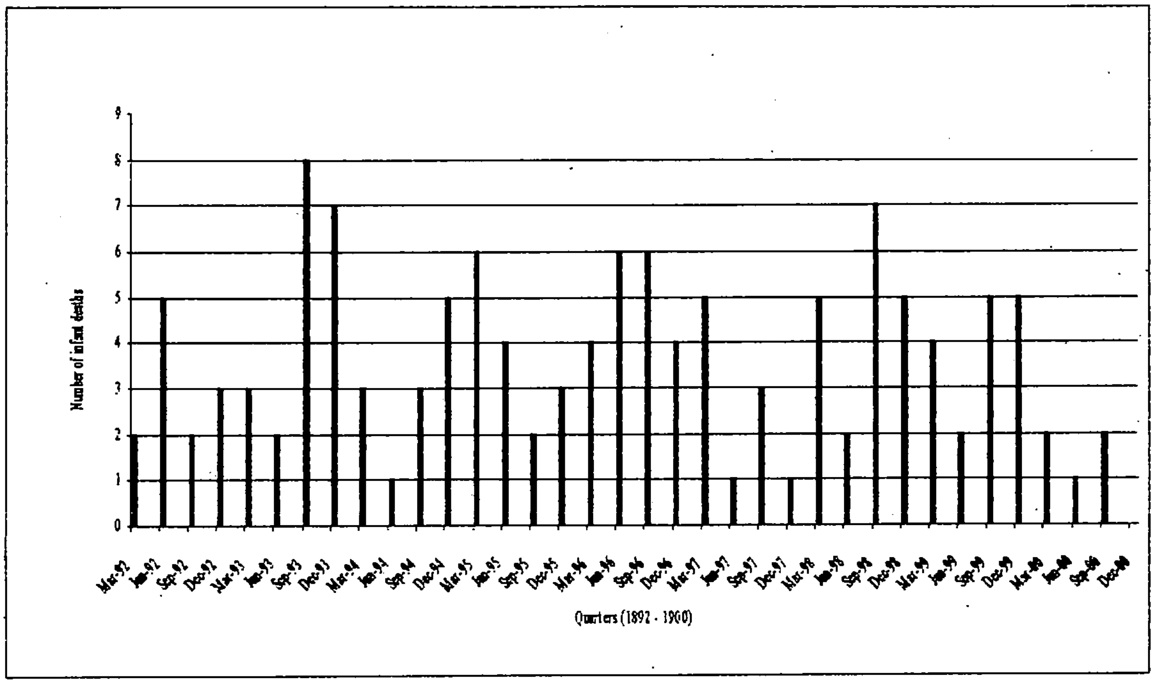
Again, factors related to the different occupational groups such as average age at vaccination as discussed previously, may also have contributed to the differences between villages. It could be argued that many factors were interlinked, and that while some would be dominant, for instance, environment, others such as socio-economic group or age at vaccination, would contribute to whether a village had a high or low IMR. This could depend on whether a particular village had a high concentration of individuals from a certain occupational group living there. Williams (1992, p.90), in her study in Sheffield, also noted that class and environment had similar cumulative effects on the IMR of different groups.

One of the other factors cited by some researchers as having a bearing on the IMR is the establishment of health and maternity services, (Szreter, 1988, p.29). Although Szreter admits that clinics were rare before the First World War, he maintains that health visiting was well established in many areas of the country. However, no evidence has been found of any health clinics being held in the Cholsey Sub-district, apart from the vaccination sessions held by the public vaccinators. No mention is made of health clinics or health visitors in any of the reports to the Local Government Board or in the Minutes of Wallingford Borough (AC2/2/2).

As will be seen from the analysis of the births and deaths registered in each village, differences have emerged in the numbers and the types of households affected (Tables 27, 28). These findings appear to support the hypothesis that environment was a strong influencing factor in infant mortality rates. One important finding is that urban/industrial centres of population such as Hagbourne did appear to have higher rates of infant deaths across the spectrum of class and socio-economic groups, agreeing with the Registrar General's national findings. Williams and Galley (1995) note that infant mortality was higher in towns because there was a larger proportion of infants exposed to the additional risks posed by urban environments. This is certainly true in the case of Hagbourne which had the largest number of births recorded for the period 1892-1900 of all the villages in the study. However, they also add that as larger numbers of people moved to cities and urban areas, the national rate did not show a corresponding increase, in fact it remained relatively steady. They claim that this fact masked 'a very real improvement in the life chances of infants within these urban areas' (Williams and Galley, 1995, p. 409). This improvement could be due to measures such as better sanitation and provision of clean drinking water supplies, which were in the process of being implemented in the Hagbourne area throughout this period. Williams and Galley (1995) also make the important point that 'it is the absence of a summer peak in mortality which holds the clue to continuous decline in the hinterland or rural areas' (1995, p.420), and it is this issue of climate and seasonality which is addressed in the following section of this chapter.

Climate/Seasonality

Graph 4 Distribution of Deaths per Quarter Cholsey 1892 - 1900 Vaccination Register Data



Most of the deaths in the Vaccination Registers between 1892 – 1900 took place in the first and third quarters of the year (Graph 4). The Registrar General's figures for Cholsey Sub-District (Table 19), also confirm that most deaths took place in the first and third quarters of the year for this period. This would appear to differ from the national figures, where it is found that there were more deaths in the third quarter than in any of the other three quarters, the majority of these deaths being attributed to diarrhoea caused by the hot weather acting on poor environmental conditions and facilitating the spread of this infectious disease. (Local Government Report, 1909, p.15).

Table 19: Deaths per Quarter 1892-1900, Cholsey Sub-District Registrar General's Figures (Vaccination Register Data Deaths in Brackets)

Year	1st	2nd	3rd	4th
1892	5 (2)	12 (5)	4 (2)	3 (3)
1893	3 (3)	3 (2)	6 (8)	7 (7)
1894	4 (3)	1 (1)	2 (3)	5 (5)
1895	6 (6)	6 (4)	3 (2)	3 (3)
1896	5 (4)	8 (6)	5 (6)	6 (4)
1897	6 (5)	1 (1)	2 (3)	2 (1)
1898	6 (5)	5 (2)	8 (7)	5 (5)
1899	4 (4)	1 (2)	7 (5)	2 (5)
1900	4 (2)	0 (1)	2 (2)	1 (0)
Totals	43 (34)	37 (24)	39 (38)	34 (33)

It was therefore decided to look at the deaths in Cholsey Sub-District for each month. Table 20 tabulates the information that appeared earlier in Graph 4. It reveals that over the period 1892-1900 more deaths occurred in December (18 deaths), than in any other month.

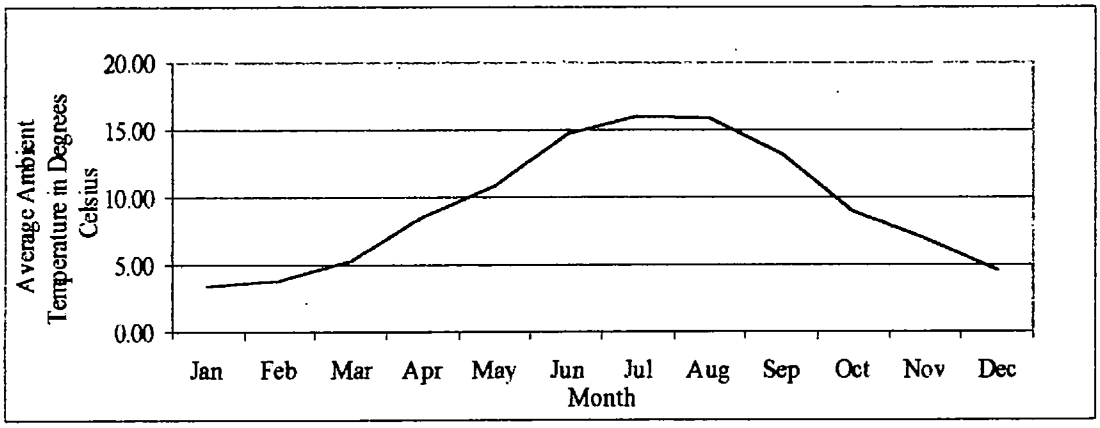
Table 20: Cholsey Vaccination Register Data 1892-1900; Deaths per month

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1892	0	1	1	0	1	4	1	0	1	1	0	2
1893	2	0	1	1	0	1	1	3	4	2	0	5
1894	2	1	0	0	0	1	0	2	1	1	0	4
1895	2	1	3	2	2	0	0	1	1	0	1	2
1896	3	1	0	1	0	5	3	2	1	1	2	1
1897	0	3	2	0	1	0	0	3	0	1	0	0
1898	0	1	4	0	0	2	3	2	2	2	1	2
1899	3	1	0	0	1	0	1	1	3	0	3	2
1900	1	1	0	1	0	0	1	0	1	0	0	0
Total	13	10	11	5	5	13	10	14	14	8	7	18

It could be argued that the national figures were weighted in favour of urban statistics; more infants were born and died in cities than in rural areas and their profiles would be reflected in the national data. The evidence for Cholsey Sub-District would appear to agree with Williams and Galley's (1995) observation that there was an absence of a summer peak in rural infant mortality rates, this summer peak being a marked feature of urban infant mortality rates. As I have already noted in the introduction, Woods, Watterson and Woodward state that the most likely reason for this 'urban effect' of generally higher summer infant mortality rates is ' that climatic conditions, especially during the third quarter of the year, interacted with poor urban sanitary environments which resulted in high levels of diarrhoea and dysentery among infants, particularly those aged between one and eleven months'. (1988, p.360).

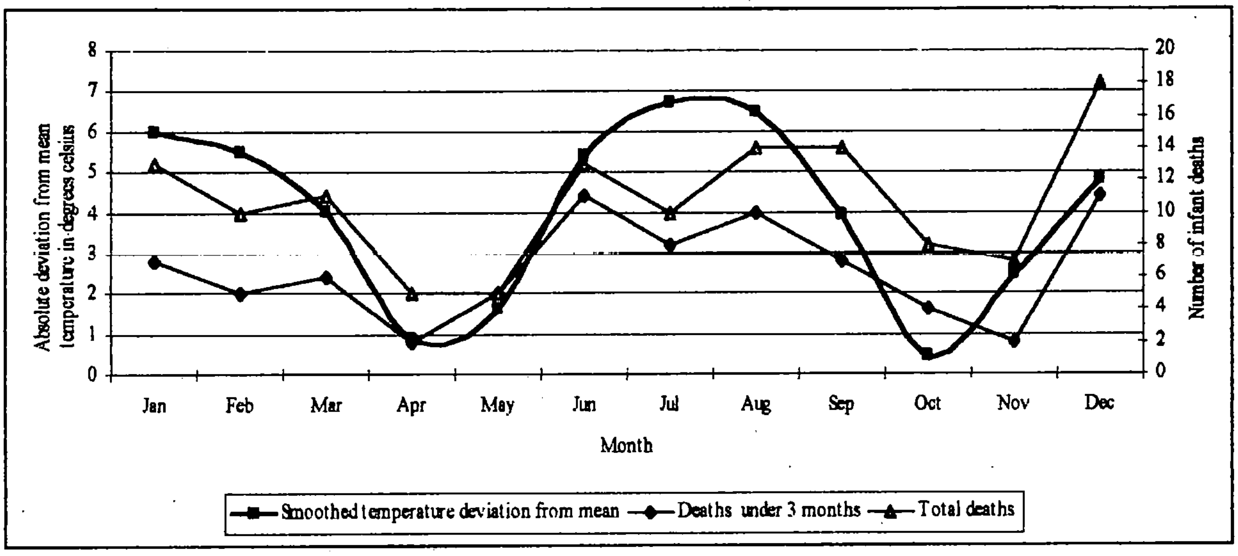
The official tables of infant mortality published by the Local Government Board include a column to show the mean temperature at Greenwich (Local Government Board Report, 1909, p.27), highlighting contemporary concern regarding the importance of this factor as an influence on infant mortality. Williams (1992) also found that infant deaths in Sheffield for the years 1870-1, peaked in the summer months.

Graph 5: Average Monthly Temperature Degrees C, for Central England 1892-1900, Met. Office



It was then decided to look at average monthly temperatures throughout this period (Graph 5). This did not appear to show any noticeable correlation between the temperature and the number of deaths per month. However, when deviations from the average temperature are looked at, a different picture emerges (Graph 6). A graph was plotted showing the deviation from the mean temperature for each month for the period 1892-1900 and compared to the number of deaths occurring each month for the same period. The value of six for January was calculated by subtracting the mean January temperature (3.37 °C) over the period 1892-1900 from the average mean annual temperature (9.35 °C) over the same time span (any negative values were converted to positive ones). As can be seen, there is a correlation between the two. The number of infants dying each month mirrors the deviation from the mean temperature throughout the months of the year.

Graph 6: Cholsey Sub-District Vaccination Register Data 1892-1900; Deaths per Month Compared to Deviation from Mean Temperature per Month (Met. Office)



Because it is known that the majority of infants who died did so before the age of three months, these were felt to be the ones most susceptible to any adverse conditions. It was therefore decided to look at these infant deaths in relation to the deviation from the mean temperature. Again, the correlation between these deaths and the deviation from the average temperature is striking. The fact that these infants were ones who were most likely to die from non-environmental causes, such as complications from the birth itself or in-uterine conditions, makes this correlation stronger than might normally be expected.

These results would appear to show that any deviation from the average temperature could have an influence on the number of infants who died. It is felt that this worked in two ways. Firstly, as previously discussed, hot weather conditions increase the multiplication of bacteria and more infectious diseases such as diarrhoea and enteric illnesses are therefore prevalent. In colder weather, any infants susceptible to respiratory and similar conditions such as pneumonia and bronchitis, are more at risk; infants from poorer families with unmet nutritional needs and therefore decreased resistance to disease would come into this category. Bronchitis and pneumonia were cited as nationally being the causes of death in significant numbers of infants by the Local Government Board (Table 21), together these diseases accounted for the same number of infant deaths as diarrhoea. In both summer and winter the most susceptible infants are those under three months of age, and this is reflected in the closer correlation between this group's deaths and any changes in temperature.

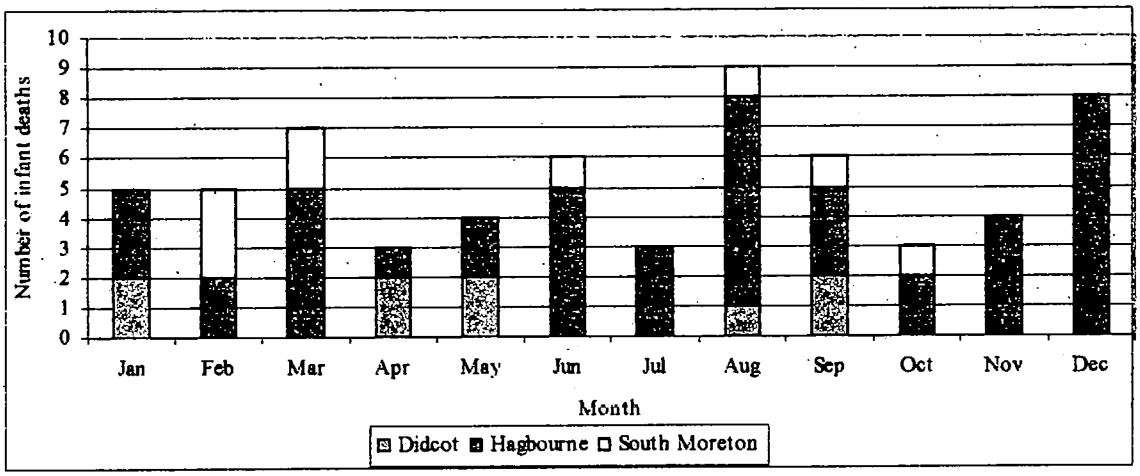
Table 21: Causes of death of Infants Under 1 Year per 1000 Births in England and Wales. Source: Local Government Board Report, 1909

Cause	Average of 1891-1900
Diarrhoeal diseases	27
Atrophy, Debility, &c	21
Premature Birth	19
Convulsions	18
Bronchitis	17
Infectious Diseases	10
Pneumonia	10
Tuberculous Diseases	8
Miscellaneous Causes	23
All Causes	153

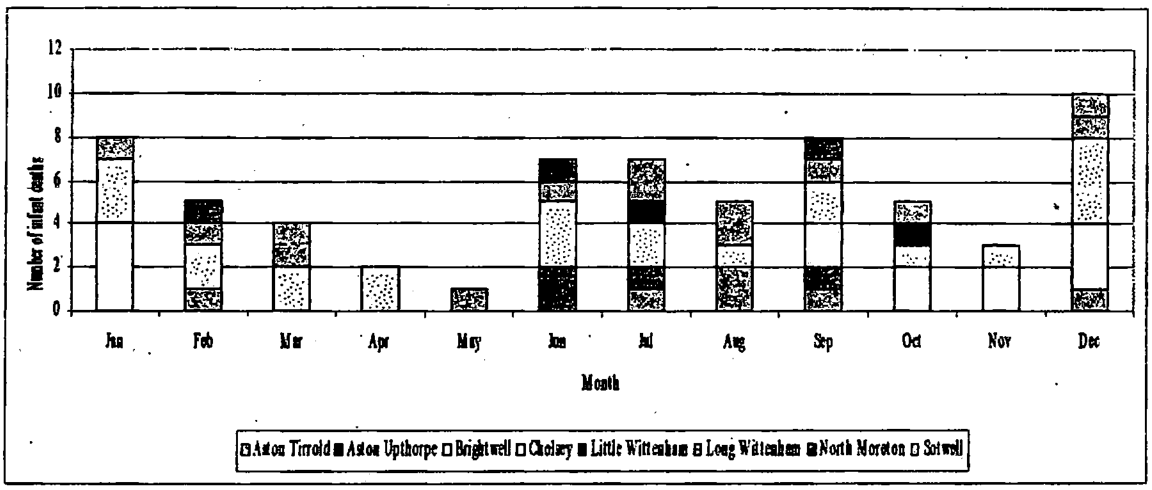
Unfortunately, because the available data for Cholsey Sub-District does not include cause of death it is impossible to check whether this was the situation here. However, on the basis of this evidence it is felt that this explanation fits the known facts. All these diseases would also have been exacerbated by poor environmental conditions and weak constitutions caused by poor nutrition due to poverty.

A comparison of the deaths per month between industrial and rural villages was then made (Graphs 7, 8). This showed that the rural villages had most deaths occurring in December with ten, followed by January and September with eight each. By contrast, the industrial villages had most deaths occurring in July with nine, followed by December with eight. Whilst this does appear to show that the industrial villages, like their larger counterparts, had a summer peak this peak is not as clear cut as it seems because they also had a spread of deaths across all the months in the year. Similarly, the rural villages lost a significant number of their infants throughout the summer months as well as the colder winter ones.

Graph 7: Distribution of Deaths per month in Industrial Villages, Cholsey Sub-District Vac. Register Data 1892-1900



Graph 8: Distribution of Deaths per Month for Rural Villages, Cholsey Sub-District Vac. Register Data 1892-1900



As has been shown, the factors influencing infant mortality would appear to work in conjunction. Poor environmental conditions would become more dangerous during the hot summer months. In winter, the colder temperatures would pick out those infants who were susceptible to bronchitis and other respiratory diseases. In both cases it would be logical to assume that those infants who came from poorer households would be the first to succumb to these influences. The following chapter therefore looks at this issue of class/socio-economic group to see if this indeed was the case.

Chapter 6: Class and Occupation

As the previous chapter looked at environment and climate as factors influencing infant mortality, it is now proposed to look at the evidence for class/socio economic group as influencing factors. Breaking down the data in a way that looked at environment, class and seasonality of each death would result in very small numbers and unsafe conclusions. However, looking at both where an infant was born and to what group it belonged may shed light on whether a higher income did indeed provide some protection against poor environmental conditions and the effects of seasonal diseases.

Table 22: Cholsey Sub District Births & Deaths 1892 - 1900 by Occupation: Vacc. Reg. Data

	Births	Deaths	Agg. IMR	Cohort. IMR
Professionals	31	5	161	289
Agricultural labourers	249	18	72	274
Other Agricultural	226	24	106	176
Farmers	24	0	0	0
Railway Labourers	36	3	83	N/a
Master Artisans and Shopkeepers	89	13	146	327
Journeymen Artisans	63	5	79	306
Artisans	72	6	83	204
Other Railway Workers	283	33*	117	300
General Labourers	65	6	92	425
Servants	50	2	40	347
Others	50	2	40	102
Illegitimate	52	12	231	416
Total	1291	129	100	

***Includes an infant born in 1900 with a date of death in 1901**

Table 23 : Cholsey Sub-District Births & Deaths 1892-1900 Distribution by Class: Vacc. Reg. Data

Class	Births	Deaths	Agg. IMR	Cohort IMR
1	9	1	111	N/A
2	85	11	129	235
3	346	36	104	250
4	726	71*	98	271
5	124	10	81	281
Total	1290	129	100	

***Includes an infant born in 1900 with a date of death in 1901**

Analysis of the data for the Cholsey Sub-district reveals that the lowest social classes and socio–economic groups suffered the highest cohort IMRs (Tables 22, 23). Infants belonging to Classes 4 and 5 had much higher chances of death before their first birthday even though, according to the aggregate data, the standard IMRs for these two groups were the lowest out of these samples. The analysis of occupations also shows that the most economically disadvantaged groups such as illegitimates and general labourers had the highest cohort IMRs. (The fact that no cohort figure is given for the railway labourers indicates that none from this cohort were observed for the full period of one year, they either died or being vaccinated, no further trace of them was found.)

There also appears to be a great discrepancy between the cohort IMRs of the agricultural labourers and general labourers. This again might be a reflection of their differing economic and environmental circumstances. Armstrong's classification system puts agricultural labourers in Class 4, and this is possibly because it was accepted that labouring on the land was better rewarded than other types of labouring work. Housing given to these land workers may have been tied to the job and therefore of a better standard than what would be available to general labourers competing for accommodation on the open market. Agricultural work, although seasonal, was fairly predictable and regular, whilst general labouring would have depended more on entrepreneurial or official enterprises, such as house building or indeed projects like the Hagbourne sewer plan.

However, some deaths occurred in homes where the father's occupation put them in a higher and presumably healthier social environment, for example; professionals, farmers and master artisans.

Table 24: Cholsey Sub-District Vaccination Data 1892 – 1900 for Agricultural, Railway & Professional Categories

	Births	Deaths	Agg. IMR	Cohort IMR
All Agricultural Workers	475	42	88	210
All Railway Workers	319	36	113	298
Professionals, Farmers, Master Artisans	144	18	125	253

Whilst the farmers did not have any infant deaths in the period under study, when they are grouped with economically similar occupations the cohort IMR of this group is still higher than all agricultural workers. This may point to the fact that people belonging to these higher occupational groups lived in areas that contained more environmental risks that their higher incomes were unable to protect them from. The fact that the farmers (in this instance only those who lived in a named farm or whose sole occupation was stated to be farmer has been given this designation) had no deaths would appear to indicate that their environmental conditions, perhaps as a result of living in isolation from centres of population and therefore sources of infection or pollution, and their higher incomes, gave them advantages over the other groups. Although it must be conceded that farmers had the lowest number of births than any other group, professionals who also had a low number of births still registered five deaths.

Professionals and masters were more likely to live within communities and as a result would appear to have suffered the effects of poor environmental conditions that their incomes could not completely shield them from. This would support Watterson's (1986, p.468) hypothesis that raised private incomes without improved environmental conditions would only have a small impact on infant mortality rates.

Further analysis was done in relation to the more specialised occupational designations.

Table 25: Cholsey Sub-District 1892-1900 Vaccination Data Distribution of Births and Deaths for Masters & Journeymen

Occupation	Births	Deaths	Agg. IMR	Cohort IMR
Masters	89	13	146	327
Journeymen	63	5	79	306
Total	152	18	118	

As can be seen the masters appear to have a much higher aggregate and cohort IMR than the journeymen (Table 25). This result could indicate that Garrett and Reid's

(1995), hypothesis, that where one lived was more important to an infant's survival rather than the occupational group to which its parents belonged, is valid. However, it is important to note that the entries in the vaccination registers were not always consistent with regard to description of occupation, as has already been mentioned, so these figures may not give the true picture. The average age at which both of these groups were vaccinated does not appear to be very different (Table 9), so it is felt that the difference in their aggregate IMRs is also significant.

Eight of the thirteen deaths belonging to the master category occurred in Hagbourne, a village for which it is known environmental conditions were particularly bad. A total of twenty-six masters lived in this village. However, of these eight deaths four were from one family and three from another. This could indicate that factors other than environment were at work here, such as hereditary or genetic weakness. It could also be the reason why the cohort IMR for masters is higher than for the lower income group of journeymen. If these two families had not lost these children, the aggregate IMR for this group would be lower than that of the journeymen.

With regard to the family from the master occupational group which lost three children, two males and one female, their birth years were 1894 and 1896 (a boy was born in March who survived only 23 days and the girl was born in December the same year, surviving only one day). No further births are recorded for this family. It would seem reasonable to suppose that in this case genetic weakness probably played a part in these deaths.

The family that lost four children is somewhat different, in that there do appear to be children who survived past twelve months. In total seven births are recorded, three children born in 1893, 1896 and 1899 all appear to have survived (the male child born in 1899 is last recorded in May 1900 being vaccinated. The others, all males, were born in 1894, 1897 and 1898 (twins who survived 23 days and 205 days respectively). The fact that three of these children who died did not live more than four weeks again points to the possibility of birth weaknesses or defects being the culprit. Unfortunately, in the absence of hard evidence it is impossible to be sure, but demographically this would appear to be a reasonable assumption.

Although seventeen journeymen also lived in Hagbourne none of their deaths occurred there. Unfortunately, because of the vagueness of the details of the place of birth in both the vaccination registers and the parish registers, it is not possible to accurately locate each individual, but it is possible to locate the general area. Hagbourne itself was split into separate areas, East, West and North.

Table 26: Cholsey Sub-District 1892-1900 Vacc. Reg. Data: Distribution of Births and Deaths for Masters (M) and Journeymen (J) by Village

Villages	M. Births	M. Deaths	J. Births	J. Deaths
Hagbourne	26	8	17	0
Aston Tirrold	2	0	7	0
Aston Upthorpe	0	0	1	1
Brightwell	11	2	11	1
Cholsey	24	1	10	0
Didcot	1	0	1	0
Long Wittenham	13	1	12	2
Moulsford	3	0	0	0
North Moreton	3	0	1	0
Sotwell	2	1	1	0
South Moreton	4	0	2	1
Total	89	13	63	5

Twenty of the masters lived in East Hagbourne and five of their deaths were here. By contrast only nine journeymen lived in East Hagbourne. This would appear to be evidence that the specific environmental factors of an area, such as the particular type of housing or water supply and sewage system impacted on the infant survival rates.

Table 27: Breakdown of births 1892 – 1900 by Occupation and Village, Cholsey Sub-District. Vaccination Register Data

	A	AL	F	GL	I	J	M	O	OA	ORW	P	RWL	S	Total
Aston Tirrold	1	19	0	1	5	7	2	0	17	1	0	0	2	55
Aston Upthorpe	0	3	3	0	1	1	0	0	10	2	1	0	2	23
Brightwell	9	52	0	25	2	11	11	4	29	0	2	1	9	155
Cholsey	29	65	3	20	6	10	24	18	58	47	8	3	12	303
Didcot	4	12	2	3	5	1	1	5	10	44	7	3	2	99
Hagbourne	15	37	5	9	21	17	26	8	40	140	8	14	4	344
Little Wittenham	1	7	3	0	1	0	0	0	15	0	0	0	5	32
Long Wittenham	7	25	1	3	5	12	13	3	22	5	1	14	7	118
Moulsford	1	10	0	0	0	0	3	1	4	0	1	0	3	23
North Moreton	0	5	1	1	2	1	3	2	8	3	0	0	1	27
South Moreton	4	14	4	2	4	2	4	6	9	40	0	0	0	89
Sotwell	1	0	2	1	0	1	2	3	4	1	3	1	3	22
Total	72	249	24	65	52	63	89	50	226	283	31	36	50	1290

Table 28: Breakdown of Deaths by Occupation and Village, Cholsey Sub-District 1892-1900 Vacc. Reg. Data

	A	AL	F	GL	I	J	M	O	OA	ORW	P	RWL	S	Total
Aston Tirrold	0	2	0	0	2	0	0	0	2	0	0	0	0	6
Aston Upthorpe	0	0	0	0	1	1	0	0	2	0	0	0	0	4
Brightwell	2	3	0	1	1	1	2	0	3	0	0	0	0	13
Cholsey	3	7	0	1	0	0	1	2	4	3	1	0	1	23
Didcot	0	0	0	1	1	0	0	0	0	4	3	0	0	9
Hagbourne	0	3	0	2	4	0	8	0	7	20*	1	1	0	46
Little Wittenham	0	0	0	0	0	0	0	0	2	0	0	0	0	2
Long Wittenham	1	1	0	0	1	2	1	0	4	0	0	2	0	12
Moulsford	0	0	0	0	0	0	0	0	0	0	0	0	0	0
North Moreton	0	0	0	1	0	0	0	0	1	1	0	0	0	3
South Moreton	0	1	0	0	2	1	0	0	0	5	0	0	0	9
Sotwell	0	0	0	0	0	0	1	0	0	0	0	0	1	2
Total	6	17	0	6	12	5	13	2	25	33	5	3	2	129

- **Includes an infant born in 1900 with a date of death in 1901**

Note: see Appendix 4 for the key to these occupations.

As previously mentioned, 'masters' have a higher death rate than 'journeymen', the majority of those who were classed as 'masters' lived in Hagbourne, Brightwell, Cholsey and Long Wittenham (Table 27). The village with the highest concentration of births from this class was Hagbourne, with a cohort IMR of 266, but deaths were mainly from the skilled railway workers group, a group that was highly concentrated in this area, 49 per cent of births from this group were registered as living here, and 61 per cent of the total number of deaths in this group were here. The other three villages with significant numbers of births to masters do not appear to have had the same impact on their cohort IMR. Cholsey for example, with 24 master births registered, lost most of its infants from the agricultural labourers group. Brightwell's deaths were more evenly spread throughout its population, possibly indicating that conditions here were uniformly bad and affected most people. The deaths in Long Wittenham were also more spread across the occupational groups, but with most occurring in the skilled agricultural workers group.

The fact that the infant deaths in Hagbourne from the master occupational group are known to have mainly occurred in two families could imply that, but for these exceptions, environmental conditions could be the major factor on the IMR. One's class and income could be some protection against the worst effects of poor environment. Looking at the total number of infant deaths for each village it can be seen that the majority of them are concentrated in the lower economic groups. It can also be seen that the group with the highest IMR in each village is usually the one with the highest concentration of births there, indicating that they constituted the bulk of the population. For example skilled railway workers were concentrated in Hagbourne, which is reflected in the birth and death figures for this village. Cholsey would appear to be more agricultural in nature with the majority of its population working on the land and this is shown in its birth and death rates for skilled and unskilled agricultural workers. These results appear to tie in with Williams' (1992, p.75) findings that 'environment discriminated against certain groups of the population, reflecting both their socio-economic background, and also the part of the town in which they lived'.

One unusual finding for Didcot is that three out of the total of five deaths for the professional group occurred here, two of them from the same family. This may be similar to the master deaths belonging to the same families in Hagbourne. The two children who belonged to the same family were aged 38 days and 238 days respectively when they died. The child who survived for the shortest time was a female born in 1892 and the firstborn of this family. A subsequent female born in 1893 appears to have lived beyond the age of one year. The third infant, a son born in 1894, was the second to die. A fourth and final child was born in 1895 who again, appears to have survived beyond infancy. The third child from the professional group to die in this village was a son born in 1899 to a family which already had two daughters born in 1892 and 1896 respectively. He only lived to the age of 203 days. It is possible, on the evidence of their age at death, to suggest that two of these infants probably did not die as a result of birth defects. However, in the absence of hard evidence, it is impossible to say for certain whether this was the case.

In this study no evidence has been found regarding the employment of married women, therefore it has not been possible to investigate whether this was a relevant factor in an infant's survival. Certainly the authorities identified the industrial occupation of married women as a contributory factor to the rate of infant mortality (Local Government Report, 1909, p.15). The only evidence that has come to light in this study is in the case of those infants who were illegitimate. In most of these cases the mother's occupation was given as domestic servant although one was classed as a field labourer, but it has not proved possible to discover whether the mother continued in her occupation after the birth of the child. It may be that such children were given to relatives to bring up. It is known that in rural areas women did seasonal work on farms but this is rarely recorded and no evidence has been found here. It is suggested that further investigation using the CEBs may shed light on this, but as noted previously, because of the problems involved in accurately identifying individuals this may not be feasible.

As can be seen from the above tables, most deaths were taking place in the lower income groups and the incidence of deaths for all groups appeared to be higher in those areas where it is known environmental conditions were particularly bad. In villages such as Aston Upthorpe, Aston Tirrold, Little Wittenham, North Moreton and Sotwell, which do not feature prominently in the MOH Reports, the number of deaths was very low and they occurred exclusively in this type of household.

In conclusion, it can be seen that in Cholsey Sub-District, income and socio-economic group did have some influence on whether a child was able to survive or not. In the worst environmental areas, a high income did appear to offer some protection. It was in the lower and unskilled income groups that most deaths occurred regardless of location. This would seem to support the hypothesis that other factors, such as environment and seasonality did influence infant mortality levels, but this influence could be exacerbated or muted depending on one's personal circumstances. Williams (1992) also makes the important point that it is not known whether different childcare practices between the different classes, such as breastfeeding, could have caused this difference between them. However, she concludes that 'childcare practices, alone, could not account for the differences in infant mortality' (1992. p.92).

As examination of the 'master' occupational group has shown, it is necessary to exercise caution when interpreting results from relatively small sample numbers. Circumstances in one or two families can influence the rates of a whole occupational group. By using sources that enable examination at the individual level it is possible to 'open –up' the analysis and look at these issues, but because of a lack of evidence for all the possible influencing factors it is not possible to give definitive answers.

Chapter 7: Conclusion

Cholsey Sub-District was chosen for this study for several reasons. In the first place the fact that the Vaccination Registers were available for examination meant that there was a wealth of previously unexplored data from which to gain evidence of health care practices for this period. No other primary source is currently available to researchers which allows access to information of this nature at these local and individual levels. In some ways it could be argued that the Vaccination Registers are as an important a research tool as the Census Enumerator Books.

From these Registers it can be seen how vaccination was provided in local areas. Measuring take-up levels also showed whether there was any opposition to it. In the case of Cholsey Sub-District acceptance of vaccination was almost universal, with very few certificates of exemption granted and only a few cases not followed up. Most of these were people who had moved away without giving notification of their new address. Many of those who did move away were followed up, sometimes many months later and a record of eventual vaccination was kept. This shows how thorough and committed local registration officers and medical authorities were, and what importance they placed on vaccination as a health measure.

Cholsey was also an ideal area to study because it had two distinct types of communities; industrial and rural. This meant that comparisons could be made between the two to see if the differences that previous researchers had found between rural and urban areas existed here. The particular period of 1892-1900 was chosen, again because of the availability of the registers and also because it was felt that by keeping the period relatively short analysis could be done in more depth, even down to the individual level.

However, as this study has shown, there are many variables to take into account before any conclusions can be reached regarding the causes of infant mortality and the reasons for the different death rates for different communities or occupational groups. Because of a lack of reliable standard data on the cause of death for each child; and because most of the infants can only be identified in a general sense, it is not possible to arrive at firm conclusions regarding all the factors that contributed to the high infant mortality rate.

However, on the whole it is felt that the evidence found for Cholsey Sub-District for the period 1892-1900 supports the hypothesis that environment together with climate/seasonality were major factors influencing the Infant Mortality Rate; other influences were also certainly present but were probably less significant. These factors, such as socio-economic group and class did have an influence that could exacerbate or enhance the primary effects of environment and climate. This is similar to Williams' (1992) findings for Sheffield in 1870-1, where she notes that socio-economic status and environment 'acted independently and the effects were cumulative' (1992, p.94). She also notes that no single factor can be held to account for the variability of infant mortality.

This would seem to be true in the case of Cholsey Sub-District. Conditions that would appear to have been totally unacceptable, from a public health point of view, did not affect every socio-economic group to the same degree, as in the case of Hagbourne with its sewage problem. In this case it was the lower socio-economic groups that were mainly affected, evidence that income could afford some protection against poor environmental conditions.

One surprising discovery is the marked correlation between deaths of infants under three months of age and the deviation from the average temperature. This is strong evidence that environment is a major influence on infant mortality. Deaths were not uniform throughout the year, comparison with the temperature shows that there is a correlation between the two. The hottest summer months and the coldest months both show peaks in infant mortality. The first was probably caused by the increased prevalence of infectious enteric and gastric diseases to which the weakest members of society, the infants, were particularly susceptible. The second was caused by the colder conditions, again picking off the weakest by way of respiratory and bronchial diseases. In both cases the poorer sectors of the community were more vulnerable, due to living in worse housing with inadequate sanitary facilities, and being nutritionally deficient through lack of income to withstand these diseases.

But it must be remembered that because the actual cause of death is not known the conclusions here can not be conclusive. Until evidence of cause of death can be linked to individuals it cannot be known how far other factors such as individual healthcare practices influenced infant mortality. Having said that, it is felt that this investigation has made some important discoveries, not least this link between infant mortality and temperature. By looking at this factor in future studies it may be possible to see whether the correlation between the two continued once environmental conditions improved, as it was known that they eventually did.

In conclusion, it is felt that Cholsey Sub-District, like many areas of the period, suffered from extremely poor environmental conditions that impacted most on those belonging to the lower socio-economic groups, and in particular the most vulnerable members of these groups – infants. The impact of these conditions acted in conjunction with other factors such as income and climate, resulting in death for those infants who belonged to the most disadvantaged groups.

Appendix 1: Vaccination Register Entries

a. number in civil birth register

b. date of birth

c. place of birth

d. child's name

e. sex

f. father's name, (or mother's name if illegitimate)

g. occupation of father, (or occupation of mother if illegitimate)

h. date of notice of vaccination

i. date of successful vaccination, postponement or insusceptibility

j. name of doctor who signed the certificate

k. date of death (if a child died before vaccination).

Appendix 2 Analysis of Private and Public Vaccinators' Data

Comparison of the Distribution of Vaccinations between Private Vaccinator Mr. Rice & Public Vaccinator Mr. Reach

Mr. Rice	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1892				4			2		1	2	1		10
1893			1	2	2			1	2	3	2		13
1894		1			3	2					3		9
1895		1	2	6	1	1		1		2	3	1	18
1896	1	1		1	1				1	2			7

Mr. Breach	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1892				22	3	1			1	24			51
1893							1	1	1	32	1		36
1894				32	2					34	1		69
1895				46	2			1		25	1		75
1896				22	2	1				32	1		58

Appendix 3: Worked Example of 1894 Cohort IMR calculation (Vaccination Register Data)

Births 156

Bin	Deaths Bin	Deaths Frequency	Losses Bin	Losses Frequency	At Risk	Life-Table Mortality	Survivors	Deaths		Cum. Deaths
1	1	5	1	0	156	0.0321	1000	32	1	32.1
2	2	0	2	0	151	0.0000	968	0	2	32.1
3	3	0	3	0	151	0.0000	968	0	3	32.1
4	4	0	4	0	151	0.0000	968	0	4	32.1
5	5	0	5	0	151	0.0000	968	0	5	32.1
6	6	0	6	0	151	0.0000	968	0	6	32.1
7	7	0	7	0	151	0.0000	968	0	7	32.1
8	8	0	8	0	151	0.0000	968	0	8	32.1
9	9	0	9	0	151	0.0000	968	0	9	32.1
10	10	0	10	0	151	0.0000	968	0	10	32.1
11	11	0	11	0	151	0.0000	968	0	11	32.1
12	12	0	12	0	151	0.0000	968	0	12	32.1
13	13	0	13	0	151	0.0000	968	0	13	32.1
14	14	0	14	0	151	0.0000	968	0	14	32.1
15	15	0	15	0	151	0.0000	968	0	15	32.1
16	16	0	16	0	151	0.0000	968	0	16	32.1
17	17	0	17	0	151	0.0000	968	0	17	32.1
18	18	1	18	0	151	0.0066	968	6	18	38.5
19	19	0	19	0	150	0.0000	962	0	19	38.5
20	20	1	20	0	150	0.0067	962	6	20	44.9
21	21	0	21	0	149	0.0000	955	0	21	44.9
22	22	0	22	0	149	0.0000	955	0	22	44.9
23	23	0	23	0	149	0.0000	955	0	23	44.9
24	24	0	24	0	149	0.0000	955	0	24	44.9
25	25	0	25	0	149	0.0000	955	0	25	44.9
26	26	0	26	0	149	0.0000	955	0	26	44.9
27	27	0	27	0	149	0.0000	955	0	27	44.9
28	28	0	28	0	149	0.0000	955	0	28	44.9
29	29	0	29	0	149	0.0000	955	0	29	44.9
30	30	0	30	1	149	0.0000	955	0	30	44.9
31	31	0	31	0	148	0.0000	955	0	31	44.9
32	32	0	32	0	148	0.0000	955	0	32	44.9
33	33	1	33	0	148	0.0068	955	6	33	51.3
34	34	0	34	0	147	0.0000	949	0	34	51.3
35	35	0	35	1	147	0.0000	949	0	35	51.3
36	36	0	36	0	146	0.0000	949	0	36	51.3
37	37	0	37	1	146	0.0000	949	0	37	51.3
38	38	0	38	1	145	0.0000	949	0	38	51.3
39	39	0	39	0	144	0.0000	949	0	39	51.3
40	40	1	40	0	144	0.0069	949	7	40	57.9
41	41	0	41	0	143	0.0000	942	0	41	57.9
42	42	0	42	1	143	0.0000	942	0	42	57.9
43	43	0	43	2	142	0.0000	942	0	43	57.9
44	44	0	44	0	140	0.0000	942	0	44	57.9
45	45	0	45	1	140	0.0000	942	0	45	57.9
46	46	1	46	0	139	0.0072	942	7	46	64.7
47	47	0	47	1	138	0.0000	935	0	47	64.7
48	48	0	48	0	137	0.0000	935	0	48	64.7
49	49	0	49	0	137	0.0000	935	0	49	64.7
50	50	0	50	1	137	0.0000	935	0	50	64.7
51	51	0	51	1	136	0.0000	935	0	51	64.7
52	52	0	52	0	135	0.0000	935	0	52	64.7
53	53	0	53	0	135	0.0000	935	0	53	64.7
54	54	0	54	0	135	0.0000	935	0	54	64.7
55	55	0	55	0	135	0.0000	935	0	55	64.7
56	56	0	56	1	135	0.0000	935	0	56	64.7
57	57	0	57	0	134	0.0000	935	0	57	64.7
58	58	0	58	1	134	0.0000	935	0	58	64.7
59	59	0	59	0	133	0.0000	935	0	59	64.7
60	60	0	60	1	133	0.0000	935	0	60	64.7
61	61	0	61	0	132	0.0000	935	0	61	64.7
62	62	0	62	1	132	0.0000	935	0	62	64.7
63	63	0	63	0	131	0.0000	935	0	63	64.7
64	64	0	64	0	131	0.0000	935	0	64	64.7
65	65	0	65	1	131	0.0000	935	0	65	64.7
66	66	0	66	0	130	0.0000	935	0	66	64.7
67	67	0	67	1	130	0.0000	935	0	67	64.7
68	68	0	68	1	129	0.0000	935	0	68	64.7
69	69	0	69	0	128	0.0000	935	0	69	64.7
70	70	0	70	1	128	0.0000	935	0	70	64.7
71	71	0	71	1	127	0.0000	935	0	71	64.7
72	72	0	72	1	126	0.0000	935	0	72	64.7
73	73	0	73	0	125	0.0000	935	0	73	64.7
74	74	0	74	0	125	0.0000	935	0	74	64.7
75	75	0	75	1	125	0.0000	935	0	75	64.7
76	76	0	76	0	124	0.0000	935	0	76	64.7
77	77	0	77	2	124	0.0000	935	0	77	64.7
78	78	0	78	1	122	0.0000	935	0	78	64.7
79	79	0	79	0	121	0.0000	935	0	79	64.7
80	80	0	80	0	121	0.0000	935	0	80	64.7
81	81	0	81	3	121	0.0000	935	0	81	64.7
82	82	0	82	1	118	0.0000	935	0	82	64.7
83	83	0	83	2	117	0.0000	935	0	83	64.7
84	84	0	84	0	115	0.0000	935	0	84	64.7
85	85	0	85	1	115	0.0000	935	0	85	64.7
86	86	0	86	0	114	0.0000	935	0	86	64.7
87	87	0	87	0	114	0.0000	935	0	87	64.7
88	88	0	88	2	114	0.0000	935	0	88	64.7
89	89	0	89	3	112	0.0000	935	0	89	64.7
90	90	0	90	3	109	0.0000	935	0	90	64.7
91	91	0	91	0	106	0.0000	935	0	91	64.7
92	92	0	92	1	106	0.0000	935	0	92	64.7
93	93	0	93	0	105	0.0000	935	0	93	64.7
94	94	0	94	1	105	0.0000	935	0	94	64.7
95	95	0	95	1	104	0.0000	935	0	95	64.7
96	96	0	96	0	103	0.0000	935	0	96	64.7
97	97	1	97	0	103	0.0097	935	9	97	73.8
98	98	0	98	1	102	0.0000	926	0	98	73.8
99	99	1	99	0	101	0.0099	926	9	99	82.9
100	100	0	100	1	100	0.0000	917	0	100	82.9
101	101	0	101	2	99	0.0000	917	0	101	82.9
102	102	0	102	2	97	0.0000	917	0	102	82.9
103	103	0	103	1	95	0.0000	917	0	103	82.9
104	104	0	104	1	94	0.0000	917	0	104	82.9
105	105	0	105	1	93	0.0000	917	0	105	82.9
106	106	0	106	0	92	0.0000	917	0	106	82.9
107	107	0	107	0	92	0.0000	917	0	107	82.9
108	108	0	108	1	92	0.0000	917	0	108	82.9
109	109	0	109	0	91	0.0000	917	0	109	82.9
110	110	0	110	0	91	0.0000	917	0	110	82.9
111	111	0	111	0	91	0.0000	917	0	111	82.9
112	112	0	112	0	91	0.0000	917	0	112	82.9

Appendix 3: Worked Example of 1894 Cohort IMR calculation (Vaccination Register Data)

113	113	0	113	2	91	0.0000	917	0	113	82.9
114	114	0	114	0	89	0.0000	917	0	114	82.9
115	115	0	115	1	89	0.0000	917	0	115	82.9
116	116	0	116	2	88	0.0000	917	0	116	82.9
117	117	0	117	0	86	0.0000	917	0	117	82.9
118	118	0	118	1	86	0.0000	917	0	118	82.9
119	119	0	119	0	85	0.0000	917	0	119	82.9
120	120	0	120	0	85	0.0000	917	0	120	82.9
121	121	0	121	1	85	0.0000	917	0	121	82.9
122	122	0	122	0	84	0.0000	917	0	122	82.9
123	123	0	123	1	84	0.0000	917	0	123	82.9
124	124	0	124	3	83	0.0000	917	0	124	82.9
125	125	0	125	2	80	0.0000	917	0	125	82.9
126	126	0	126	1	78	0.0000	917	0	126	82.9
127	127	0	127	0	77	0.0000	917	0	127	82.9
128	128	0	128	1	77	0.0000	917	0	128	82.9
129	129	1	129	1	76	0.0132	917	12	129	95.0
130	130	0	130	0	74	0.0000	905	0	130	95.0
131	131	0	131	0	74	0.0000	905	0	131	95.0
132	132	0	132	1	74	0.0000	905	0	132	95.0
133	133	0	133	1	73	0.0000	905	0	133	95.0
134	134	0	134	0	72	0.0000	905	0	134	95.0
135	135	0	135	1	72	0.0000	905	0	135	95.0
136	136	0	136	1	71	0.0000	905	0	136	95.0
137	137	0	137	0	70	0.0000	905	0	137	95.0
138	138	0	138	0	70	0.0000	905	0	138	95.0
139	139	0	139	0	70	0.0000	905	0	139	95.0
140	140	0	140	0	70	0.0000	905	0	140	95.0
141	141	0	141	1	70	0.0000	905	0	141	95.0
142	142	0	142	1	69	0.0000	905	0	142	95.0
143	143	0	143	0	68	0.0000	905	0	143	95.0
144	144	0	144	1	68	0.0000	905	0	144	95.0
145	145	0	145	1	67	0.0000	905	0	145	95.0
146	146	0	146	0	66	0.0000	905	0	146	95.0
147	147	0	147	0	66	0.0000	905	0	147	95.0
148	148	0	148	2	66	0.0000	905	0	148	95.0
149	149	0	149	0	64	0.0000	905	0	149	95.0
150	150	0	150	0	64	0.0000	905	0	150	95.0
151	151	0	151	1	64	0.0000	905	0	151	95.0
152	152	0	152	1	63	0.0000	905	0	152	95.0
153	153	1	153	0	62	0.0161	905	15	153	109.6
154	154	0	154	3	61	0.0000	890	0	154	109.6
155	155	0	155	0	58	0.0000	890	0	155	109.6
156	156	0	156	0	58	0.0000	890	0	156	109.6
157	157	0	157	0	58	0.0000	890	0	157	109.6
158	158	0	158	0	58	0.0000	890	0	158	109.6
159	159	0	159	1	58	0.0000	890	0	159	109.6
160	160	0	160	1	57	0.0000	890	0	160	109.6
161	161	0	161	0	56	0.0000	890	0	161	109.6
162	162	0	162	0	56	0.0000	890	0	162	109.6
163	163	0	163	1	56	0.0000	890	0	163	109.6
164	164	0	164	0	55	0.0000	890	0	164	109.6
165	165	0	165	0	55	0.0000	890	0	165	109.6
166	166	0	166	1	55	0.0000	890	0	166	109.6
167	167	0	167	0	54	0.0000	890	0	167	109.6
168	168	0	168	0	54	0.0000	890	0	168	109.6
169	169	0	169	0	54	0.0000	890	0	169	109.6
170	170	0	170	2	54	0.0000	890	0	170	109.6
171	171	0	171	0	52	0.0000	890	0	171	109.6
172	172	0	172	1	52	0.0000	890	0	172	109.6
173	173	0	173	0	51	0.0000	890	0	173	109.6
174	174	0	174	0	51	0.0000	890	0	174	109.6
175	175	0	175	0	51	0.0000	890	0	175	109.6
176	176	0	176	1	51	0.0000	890	0	176	109.6
177	177	0	177	0	50	0.0000	890	0	177	109.6
178	178	0	178	0	50	0.0000	890	0	178	109.6
179	179	0	179	0	50	0.0000	890	0	179	109.6
180	180	0	180	1	50	0.0000	890	0	180	109.6
181	181	0	181	1	49	0.0000	890	0	181	109.6
182	182	0	182	0	48	0.0000	890	0	182	109.6
183	183	0	183	1	48	0.0000	890	0	183	109.6
184	184	0	184	0	47	0.0000	890	0	184	109.6
185	185	0	185	0	47	0.0000	890	0	185	109.6
186	186	0	186	0	47	0.0000	890	0	186	109.6
187	187	0	187	0	47	0.0000	890	0	187	109.6
188	188	0	188	1	47	0.0000	890	0	188	109.6
189	189	0	189	1	46	0.0000	890	0	189	109.6
190	190	0	190	0	45	0.0000	890	0	190	109.6
191	191	0	191	0	45	0.0000	890	0	191	109.6
192	192	0	192	0	45	0.0000	890	0	192	109.6
193	193	0	193	1	45	0.0000	890	0	193	109.6
194	194	0	194	0	44	0.0000	890	0	194	109.6
195	195	0	195	0	44	0.0000	890	0	195	109.6
196	196	0	196	0	44	0.0000	890	0	196	109.6
197	197	0	197	1	44	0.0000	890	0	197	109.6
198	198	0	198	0	43	0.0000	890	0	198	109.6
199	199	0	199	1	43	0.0000	890	0	199	109.6
200	200	0	200	1	42	0.0000	890	0	200	109.6
201	201	0	201	0	41	0.0000	890	0	201	109.6
202	202	0	202	0	41	0.0000	890	0	202	109.6
203	203	0	203	1	41	0.0000	890	0	203	109.6
204	204	0	204	0	40	0.0000	890	0	204	109.6
205	205	0	205	0	40	0.0000	890	0	205	109.6
206	206	1	206	0	40	0.0250	890	22	206	131.9
207	207	0	207	1	39	0.0000	868	0	207	131.9
208	208	0	208	1	38	0.0000	868	0	208	131.9
209	209	0	209	0	37	0.0000	868	0	209	131.9
210	210	0	210	1	37	0.0000	868	0	210	131.9
211	211	0	211	1	36	0.0000	868	0	211	131.9
212	212	0	212	0	35	0.0000	868	0	212	131.9
213	213	0	213	0	35	0.0000	868	0	213	131.9
214	214	0	214	1	35	0.0000	868	0	214	131.9
215	215	0	215	0	34	0.0000	868	0	215	131.9
216	216	0	216	0	34	0.0000	868	0	216	131.9
217	217	0	217	1	34	0.0000	868	0	217	131.9
218	218	0	218	0	33	0.0000	868	0	218	131.9
219	219	0	219	1	33	0.0000	868	0	219	131.9
220	220	0	220	0	32	0.0000	868	0	220	131.9
221	221	0	221	1	32	0.0000	868	0	221	131.9
222	222	0	222	0	31	0.0000	868	0	222	131.9
223	223	0	223	1	31	0.0000	868	0	223	131.9
224	224	0	224	1	30	0.0000	868	0	224	131.9
225	225	0	225	2	29	0.0000	868	0	225	131.9
226	226	0	226	2	27	0.0000	868	0	226	131.9
227	227	0	227	0	25	0.0000	868	0	227	131.9
228	228	0	228	1	25	0.0000	868	0	228	131.9

Appendix 3: Worked Example of 1894 Cohort IMR calculation (Vaccination Register Data)

229	229	0	229	2	24	0.0000	868	0	229	131.9
230	230	0	230	0	22	0.0000	868	0	230	131.9
231	231	0	231	0	22	0.0000	868	0	231	131.9
232	232	0	232	1	22	0.0000	868	0	232	131.9
233	233	0	233	1	21	0.0000	868	0	233	131.9
234	234	0	234	0	20	0.0000	868	0	234	131.9
235	235	0	235	0	20	0.0000	868	0	235	131.9
236	236	0	236	0	20	0.0000	868	0	236	131.9
237	237	0	237	0	20	0.0000	868	0	237	131.9
238	238	1	238	0	20	0.0500	868	43	238	175.3
239	239	0	239	0	19	0.0000	825	0	239	175.3
240	240	0	240	0	19	0.0000	825	0	240	175.3
241	241	0	241	0	19	0.0000	825	0	241	175.3
242	242	0	242	0	19	0.0000	825	0	242	175.3
243	243	0	243	0	19	0.0000	825	0	243	175.3
244	244	0	244	0	19	0.0000	825	0	244	175.3
245	245	0	245	0	19	0.0000	825	0	245	175.3
246	246	0	246	0	19	0.0000	825	0	246	175.3
247	247	0	247	0	19	0.0000	825	0	247	175.3
248	248	0	248	0	19	0.0000	825	0	248	175.3
249	249	0	249	0	19	0.0000	825	0	249	175.3
250	250	0	250	0	19	0.0000	825	0	250	175.3
251	251	0	251	0	19	0.0000	825	0	251	175.3
252	252	0	252	0	19	0.0000	825	0	252	175.3
253	253	0	253	0	19	0.0000	825	0	253	175.3
254	254	0	254	0	19	0.0000	825	0	254	175.3
255	255	0	255	0	19	0.0000	825	0	255	175.3
256	256	0	256	0	19	0.0000	825	0	256	175.3
257	257	0	257	0	19	0.0000	825	0	257	175.3
258	258	0	258	1	19	0.0000	825	0	258	175.3
259	259	0	259	0	18	0.0000	825	0	259	175.3
260	260	0	260	0	18	0.0000	825	0	260	175.3
261	261	0	261	1	18	0.0000	825	0	261	175.3
262	262	0	262	0	17	0.0000	825	0	262	175.3
263	263	0	263	0	17	0.0000	825	0	263	175.3
264	264	0	264	0	17	0.0000	825	0	264	175.3
265	265	0	265	0	17	0.0000	825	0	265	175.3
266	266	0	266	0	17	0.0000	825	0	266	175.3
267	267	0	267	0	17	0.0000	825	0	267	175.3
268	268	0	268	0	17	0.0000	825	0	268	175.3
269	269	0	269	0	17	0.0000	825	0	269	175.3
270	270	0	270	0	17	0.0000	825	0	270	175.3
271	271	0	271	0	17	0.0000	825	0	271	175.3
272	272	0	272	0	17	0.0000	825	0	272	175.3
273	273	0	273	0	17	0.0000	825	0	273	175.3
274	274	0	274	1	17	0.0000	825	0	274	175.3
275	275	0	275	0	16	0.0000	825	0	275	175.3
276	276	0	276	0	16	0.0000	825	0	276	175.3
277	277	0	277	0	16	0.0000	825	0	277	175.3
278	278	0	278	0	16	0.0000	825	0	278	175.3
279	279	0	279	0	16	0.0000	825	0	279	175.3
280	280	0	280	0	16	0.0000	825	0	280	175.3
281	281	0	281	1	16	0.0000	825	0	281	175.3
282	282	0	282	0	15	0.0000	825	0	282	175.3
283	283	0	283	0	15	0.0000	825	0	283	175.3
284	284	0	284	0	15	0.0000	825	0	284	175.3
285	285	0	285	0	15	0.0000	825	0	285	175.3
286	286	0	286	0	15	0.0000	825	0	286	175.3
287	287	0	287	0	15	0.0000	825	0	287	175.3
288	288	0	288	0	15	0.0000	825	0	288	175.3
289	289	0	289	0	15	0.0000	825	0	289	175.3
290	290	0	290	0	15	0.0000	825	0	290	175.3
291	291	0	291	0	15	0.0000	825	0	291	175.3
292	292	0	292	0	15	0.0000	825	0	292	175.3
293	293	0	293	0	15	0.0000	825	0	293	175.3
294	294	0	294	0	15	0.0000	825	0	294	175.3
295	295	0	295	0	15	0.0000	825	0	295	175.3
296	296	0	296	0	15	0.0000	825	0	296	175.3
297	297	0	297	0	15	0.0000	825	0	297	175.3
298	298	0	298	0	15	0.0000	825	0	298	175.3
299	299	0	299	0	15	0.0000	825	0	299	175.3
300	300	0	300	1	15	0.0000	825	0	300	175.3
301	301	0	301	0	14	0.0000	825	0	301	175.3
302	302	0	302	0	14	0.0000	825	0	302	175.3
303	303	0	303	0	14	0.0000	825	0	303	175.3
304	304	0	304	0	14	0.0000	825	0	304	175.3
305	305	0	305	0	14	0.0000	825	0	305	175.3
306	306	0	306	0	14	0.0000	825	0	306	175.3
307	307	0	307	0	14	0.0000	825	0	307	175.3
308	308	0	308	0	14	0.0000	825	0	308	175.3
309	309	0	309	0	14	0.0000	825	0	309	175.3
310	310	0	310	0	14	0.0000	825	0	310	175.3
311	311	0	311	0	14	0.0000	825	0	311	175.3
312	312	0	312	0	14	0.0000	825	0	312	175.3
313	313	0	313	0	14	0.0000	825	0	313	175.3
314	314	0	314	0	14	0.0000	825	0	314	175.3
315	315	0	315	0	14	0.0000	825	0	315	175.3
316	316	0	316	0	14	0.0000	825	0	316	175.3
317	317	0	317	0	14	0.0000	825	0	317	175.3
318	318	0	318	0	14	0.0000	825	0	318	175.3
319	319	0	319	0	14	0.0000	825	0	319	175.3
320	320	0	320	0	14	0.0000	825	0	320	175.3
321	321	0	321	0	14	0.0000	825	0	321	175.3
322	322	0	322	0	14	0.0000	825	0	322	175.3
323	323	0	323	0	14	0.0000	825	0	323	175.3
324	324	0	324	0	14	0.0000	825	0	324	175.3
325	325	0	325	0	14	0.0000	825	0	325	175.3
326	326	0	326	0	14	0.0000	825	0	326	175.3
327	327	0	327	0	14	0.0000	825	0	327	175.3
328	328	0	328	0	14	0.0000	825	0	328	175.3
329	329	0	329	0	14	0.0000	825	0	329	175.3
330	330	0	330	0	14	0.0000	825	0	330	175.3
331	331	0	331	0	14	0.0000	825	0	331	175.3
332	332	0	332	0	14	0.0000	825	0	332	175.3
333	333	0	333	0	14	0.0000	825	0	333	175.3
334	334	0	334	0	14	0.0000	825	0	334	175.3
335	335	0	335	0	14	0.0000	825	0	335	175.3
336	336	0	336	1	14	0.0000	825	0	336	175.3
337	337	0	337	0	13	0.0000	825	0	337	175.3
338	338	0	338	0	13	0.0000	825	0	338	175.3
339	339	0	339	1	13	0.0000	825	0	339	175.3
340	340	0	340	0	12	0.0000	825	0	340	175.3
341	341	0	341	0	12	0.0000	825	0	341	175.3
342	342	0	342	0	12	0.0000	825	0	342	175.3
343	343	0	343	0	12	0.0000	825	0	343	175.3
344	344	0	344	0	12	0.0000	825	0	344	175.3

Appendix 3: Worked Example of 1894 Cohort IMR calculation (Vaccination Register Data)

345	345	0	345	0	12	0.0000	825	0	345	175.3
346	346	0	346	0	12	0.0000	825	0	346	175.3
347	347	0	347	0	12	0.0000	825	0	347	175.3
348	348	0	348	0	12	0.0000	825	0	348	175.3
349	349	0	349	0	12	0.0000	825	0	349	175.3
350	350	0	350	0	12	0.0000	825	0	350	175.3
351	351	0	351	0	12	0.0000	825	0	351	175.3
352	352	0	352	0	12	0.0000	825	0	352	175.3
353	353	0	353	0	12	0.0000	825	0	353	175.3
354	354	0	354	0	12	0.0000	825	0	354	175.3
355	355	0	355	0	12	0.0000	825	0	355	175.3
356	356	0	356	0	12	0.0000	825	0	356	175.3
357	357	0	357	0	12	0.0000	825	0	357	175.3
358	358	0	358	0	12	0.0000	825	0	358	175.3
359	359	0	359	0	12	0.0000	825	0	359	175.3
360	360	0	360	0	12	0.0000	825	0	360	175.3
361	361	0	361	0	12	0.0000	825	0	361	175.3
362	362	0	362	0	12	0.0000	825	0	362	175.3
363	363	0	363	0	12	0.0000	825	0	363	175.3
364	364	0	364	0	12	0.0000	825	0	364	175.3
365	365	0	365	1	12	0.0000	825	0	365	175.3
	More	4	More	4	11	0.3638	825	825		1000.0
	Total	16		128						

Aggregate based infant mortality 102.6

Individual-Based Infant Mortality 175.3

Appendix 4: Key to Occupations for Tables 27 and 28

A - Artisans
AL - Agricultural Labourer
F - Farmer
GL - General Labourer
I - Illegitimate
J - Journeyman
M - Master, Shopkeeper
O - Other
OA - Other Agricultural Worker
ORW - Other Railway Workers
P - Professional
RWL - Railway Labourers
S - Servant

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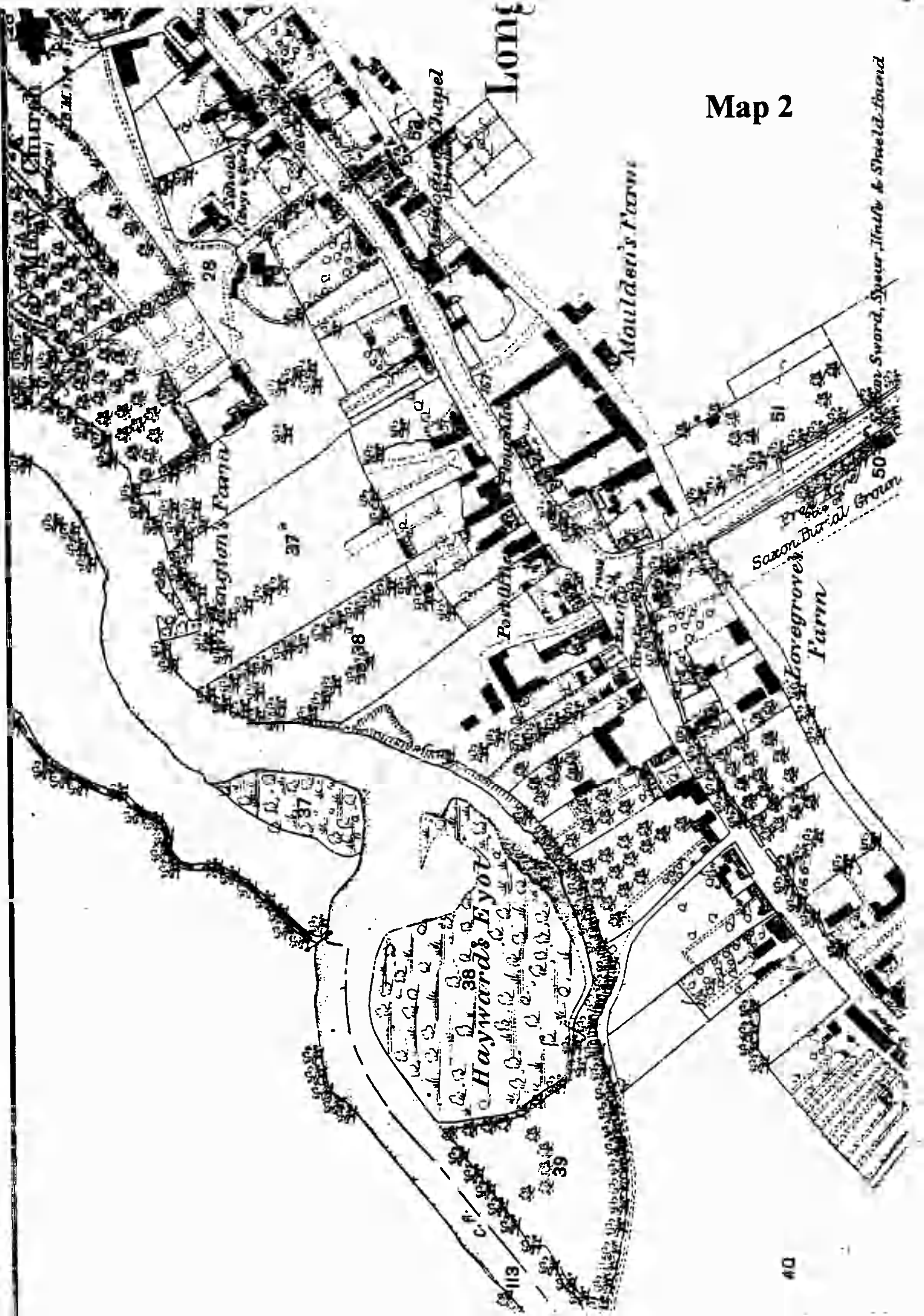
Map 1

Map 2


Long
Chapel
School
Hayward's Eyot
Saxon Burial Ground
Lovegrove's Farm
Sword, Spear-Head & Shield-Boss